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# Soviet Union

## FOREIGN MILITARY REVIEW

No 8, August 1988

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FOREIGN MILITARY REVIEW

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## Following the Course of the 19th All-Union CPSU Conference

*18010215a Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 3-6*

[Text] The 19th All-Union CPSU Conference will enter the history of our party and the Soviet state as one of the forums of special significance, one which began a new period in the life of the society and in development of the theory and practice of socialism. The conference imparted a powerful impetus to the profound revolutionary processes occurring within the country, firmed up the directions of restructuring and mapped out the paths, forms and methods of work of party organs today. A CPSU Central Committee Plenum held in July 1988 noted that the conference adopted decisions "which, when implemented, will make it possible to significantly accelerate the processes of restructuring, radical economic reform and democratization of Soviet society."

The fundamental issue that was brought up for consideration at the conference was democratization of all aspects of the society's life and, with this purpose, reform of the political system, including the party's organizational structure and function. The priority task of expanding the front of restructuring and consolidating its development by rebuilding the superstructure and making revolutionary renewal of our society irreversible was discussed extensively.

The problem of democratizing society and the party was subjected to meticulous, profound analysis at the conference, especially from the points of view of the principal sources, historical experience and influence on social development.

A major discussion went on at the conference on creating a political system which would be in keeping with the nature and modern stage of socialism's development.

The democratic transformations planned out by the party are called upon to create the political prerequisites necessary for the socialist society to become stably dynamic, firmly relying on effective internal sources of self-development.

Restructuring is dictated by the times. But its objective necessity has now become especially acute. The political system, which evolved in the first postrevolutionary years and which was later subjected to serious deformations, required transformation as well. The government structure that was formed was oriented on creating, consolidating and enlarging the authority of the personality and limiting the control of all communists, constitutional organs and people over it (going as far as elimination of such control), and the power of the state administration underwent immoderate expansion at the expense of society.

As was emphasized in the report of the CPSU Central Committee general secretary to the conference, minimization of the need for democracy resulted in the fact that the presently existing political system turned out to be indifferent to what was happening, and inert in relation to all that was new and progressive. It developed an unwieldy bureaucracy, it caused social energy and initiative to weaken, and it generated a simplified image of socialist popular rule.

This is why the party concluded that major changes were necessary. The reform of the political system approved by the conference is viewed as a movement toward freedom and responsibility, toward a special social consciousness in the conditions of an open society. We need to increase the society's intellectual potential, widen the possibilities of its formation and application to vital causes, and nurture high political culture.

Much has changed in the life of Soviet society since April 1985. Democracy and glasnost have become firmly entrenched in its ideological and political atmosphere. A process of rehabilitation of the country's economy, a change in its orientation toward satisfaction of the people's daily needs, has begun. The new methods of management are gathering momentum. The first fruits of the transformations inspire confidence in the correctness of the adopted course.

At the same time it was emphasized in the report and in statements made at the conference that restructuring is not proceeding as energetically and effectively in some directions as would be desired. Why? First of all there is the burdensomeness of the legacy we have been left with. In a number of areas it has been found to be more of an obstacle than was imagined 3 years ago. This pertains to social consciousness, the organizational framework that has evolved, and the inertia of conservatism. The urgent task today is to carry out the Food Program, which requires concentration of the main effort in this area.

The role of the party as the society's political vanguard was an issue at the center of attention at the conference. The report, the statements and the resolutions revealed the firm conviction of the delegates that the program of action drawn up by the 27th CPSU Congress and enriched by the experience of restructuring is still effective, and that it enjoys the unconditional support of the people.

Fundamental restructuring of the style, procedures, forms and methods of work of party organs and organizations, all the way up to the CPSU Central Committee, has been recognized to be a necessity today. All levels of

the party are called upon to tackle the job of determining and implementing the political strategy; in doing so, it must work through communists in the soviets, in state organs and in labor collectives.

But the content and methods of the party's activity must follow Lenin's principles completely. What does this mean? The implication is, first of all, that its policy must be carried out exclusively through organizational, personnel and ideological work, with the strictest possible compliance with the laws and democratic principles of social life.

Party organizations will have to decisively curtail the practice of usurping the authority and doing the work of state organs, and maintaining a dictatorial style of leadership over trade unions, the Komsomol, creative unions and other social organizations. The party would still remain a ruling party, and it possesses everything it needs to maintain its leadership role. And mainly, the 20 million communists through which it is called upon to implement the political course in all spheres of the life of society.

As was emphasized at the conference, our society must be oriented on an effective, dynamic economy directed at satisfying the needs of the laborers. What this would require primarily is social justice, high culture and morality, popular rule, socialist self-control by the people, equality of all nations and nationalities, their social and spiritual progress, mutual enrichment, and a life that is full and vigorous in material and spiritual respects. These factors are the elements of a qualitatively new state of our society, of a humane image of socialism.

The conference posed a task of historical importance—confirming and creatively developing Lenin's principles of nationality policy, and decisively cleansing the society of its unnatural finish and blemishes. The main thing is to discern the perpetually arising problems that life presents, and to seek and promptly implement the right solutions to them. Internationalist ideology is incompatible with any forms of chauvinism and nationalism.

Restructuring has brought glasnost up to the forward edge of life, where it is being implemented in the most diverse forms. Glasnost is not only a word meaning enlightenment: It is also a deeply moral problem. In our socialist society, it is an inseparable prerogative of the people. It is first and foremost a sign of the health and strength of the society, a condition of its normal function, and an indicator of its social and political maturity.

The problem of forming a lawful socialist state in which law and equality prevail over all without exception, where personal human rights are assured in the social, spiritual, political and moral spheres, where the soviets exercise real sovereignty from top to bottom, where tens of millions of persons participate in administration, and where self- management and self-regulation are allowed free rein, was widely discussed at the conference.

Real popular sovereignty and wide encouragement of laborers to participate in management of state and social affairs are the decisive factors of successful restructuring. It was with a sense of satisfaction that the decision was made to create a unified system of social and state control that will rely on the initiative and activity of the masses and of social organizations.

Special significance is attached today to raising the competency with which affairs are organized. We need major changes in the procedure for developing and adopting management decisions. It was the shared opinion of conference delegates that functions and powers must be transfered increasingly more from the top down, right down to the labor collectives, so that their soviets and all laborers could exercise their rights in full measure.

At the conference the CPSU once again confirmed the course toward restoration of Lenin's policy in science and culture. It may be expressed briefly as follows: creation of the most favorable possibilities for progress of the human spirit and of its creative foundations, support of the entire diversity in scientific and artistic creativity, development of an atmosphere of healthy competition, and exclusion of incompetent interference. Only that which is directed against the individual, against the moral health of society and the worth of the personality, cannot be accepted.

A program-level political position was worked out in relation to all of the fundamental issues that have been the subject of discussion by the whole party and all the people. Drafted and approved by the conference, the resolutions "On the Progress of Implementing Decisions of the 27th CPSU Congress and the Tasks of Deepening Restructuring," "On Democratization of Soviet Society and Reform of the Political System," "On the Struggle Against Bureaucratism," "On International Relations," "On Glasnost" and "On Legal Reform" have enormous significance to the country's destiny, they are an inseparable component of change, and a powerful accelerator of change.

Restructuring and the profound transformations associated with it are reflected in the party's approaches to the problems of world development today. The idea of the universality of the historical destiny of mankind and the priority of general human values is at the foundation of the new way of political thinking. It opens up possibilities for democratic solutions to problems of the modern world in the interests of all peoples, and it provides a reasonable, constructive basis for practical actions.

The USSR has been creating extensive contacts with representatives of other countries—from heads of state and government to simple citizens, with universally recognized authorities in science and culture, with prominent writers, with the leaders and delegations of political parties, with social organizations and movements,

with trade union and social democratic leaders, and with religious officials and parliamentarians. This has played a great role in confirming the new way of political thinking.

Soviet foreign policy has been made dynamic, such that a number of new major initiatives have become possible. They include the program for gradual elimination of nuclear weapons by the year 2000, a system of comprehensive international security, freedom of choice, a balance of interests, the "all-European house," restructuring of relations in the Asia-Pacific region, sufficiency of defense and the doctrine of nonaggression, arms reduction as a means of strengthening national and regional security, recall of troops from foreign territories and elimination of bases, measures of trust, international economic security, the idea of direct participation of the authority of science in world policy and so on.

Dialogue has been laid at the basis of the USSR's international contacts, and a readiness for deep mutual control has been proclaimed in the sphere of disarmament. This has made it possible to widen the bounds of trust far beyond the customary spectrum of attitudes, thus revealing considerable potential for mutual understanding and readiness for coexistence and cooperation.

In world policy, and chiefly in the area of disarmament, we already have major accomplishments such as the summit talks in Geneva and Reykjavik, which paved the way for progress in negotiations and which predetermined the success of subsequent summit talks in Washington and Moscow. The entire international situation is changing as a result.

It was noted at the conference that world socialism is experiencing a turning point. Attainment of new summits by socialist countries and release of their potentials in the national framework and on the international scale are raising the prestige and role of socialism in world development. Sovereignty, independence, equal rights and noninterference are becoming universally recognized roles of international relations, which is a major accomplishment of the 20th century.

The new way of thinking and the policy based on it correctly reflected the urgent needs and imperatives of the modern world, resurrected hope and opened the door to qualitative changes in the consciousness of mankind.

The Geneva accords and the beginning of the withdrawal of the limited contingent of Soviet troops from Afghanistan have become an important international landmark in political settlement of regional conflicts, which harbor a danger to the world as a whole and which inhibit the progress of nations. Deep gratefulness to Soviet soldiers and to all people whose destinies were touched and who were burned by the war in Afghanistan was expressed from the podium of the conference in the name of the party and the people.

An analysis of present realities permits the suggestion that if we are able to consolidate and develop these realities, the world at the turn of the 21st century will be determined by the following trends:

gradual demilitarization and humanization of international relations, such that reason, knowledge and moral roles, and not egoistic aspirations and prejudices, will finally be what motivates states in conflict resolution and in attainment of a balance of interests, and the right of free choice will be recognized for all;

maintenance of the security of states will move more and more from the sphere of relationships between military potentials into the sphere of political interaction and strict fulfillment of international obligations; a universal system of international security will begin to evolve, chiefly owing to an increase in the role and effectiveness of the United Nations;

growth of scientific and technical potential will be utilized in a more civilized manner for joint solution of global, economic, ecological, food, medical and other problems to the benefit of all mankind;

diverse and well-meaning communication between independent states and nations will dependably promote their mutual material and spiritual enrichment and strengthen the structure of universal peace.

Having improved the international activity of the CPSU Central Committee based on the new way of political thinking, the conference confirmed that only a political approach to resolving the conflicts of world development and settling conflicts can make it possible for the USSR to play the role granted to it by history in assuring survival of mankind and its progress.

As is emphasized in one of the conference's resolutions, foreign economic activity must make an increasingly greater contribution to freeing the country's resources for peaceful construction. Restructuring requires a foreign policy which adequately reflects its humanitarian essence and opens up a wide avenue to the Soviet Union for mutually advantageous cooperation and diverse democratic ties with the surrounding world.

These conclusions of the conference are in accord with the assessments of many Western politicians and public figures. In the opinion of English Member of Parliament Ken Livingstone, the conference will have a favorable effect on the situation in the world. Owing to the progress of detente, we are already able to resolve the tangled issues of arms reduction, and the international climate is changing. Changes within the USSR—and it was the conference which determined the course of these changes—are making its countenance much more attractive. Therefore, Livingstone emphasized, it is becoming increasingly more difficult for reactionary forces of the West to continue the cold war.

M. Geiger, a foreign affairs expert of the Christian Democratic Union and Christian Social Union faction of West Germany's parliament, declared that the openness and the diversity of criticism typical of the All-Union CPSU Conference deserve sympathy. Growth of glasnost in Moscow will probably help to eliminate the lack of trust in the USSR abroad.

The new way of political thinking is making it possible to find ways to oppose the policy of force on a political foundation wider than before.

This is what determines our defense build-up, the effectiveness of which must be ensured from this day forward predominantly by qualitative parameters in respect to both technology and military science on one hand and the composition of the armed forces on the other. It must guarantee dependable security of the Soviet state and its allies, and it must be exercised in strict correspondence with defensive doctrine.

The consciousness of the Soviet people and of armed forces soldiers is restructuring and developing on the basis of the new way of political thinking. This consciousness is being revolutionized, and it is encouraging active mastery of foreign affairs, and the preparedness to act decisively in defense of the motherland and the revolutionary accomplishments of socialism.



## Principles of Rear Support of NATO Joint Forces

*18010215b Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 7-13*

[Article by Lt Col M. Seliverstov; for the beginning, see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 6, 1988, pp 7-12]

[Text] Official manuals of the USA and NATO devote considerable room to the organizational structure of rear control organs and their practical activities. Judging from reports in the foreign press, all rear services agencies contributing to rear support to NATO joint forces may be conditionally divided into three basic levels depending on the specific features and scale of their missions—strategic, operational and troop.

**The strategic level of the rear** is intended to support preparation and conduct of war in general or strategic operations lasting from several weeks to several months at the scale of NATO's entire "zone of responsibility," and in individual theaters of war and theaters of military operations. It is based on supreme coalition rear services agencies, which function within the system of the bloc's executive organs and under the staffs of the NATO joint forces (down to the theater of military operations inclusively) and national supreme rear services agencies (centrally subordinated predominantly).

Coalition organs, which do not have any rear forces and resources subordinated to them, perform chiefly consultative, planning, controlling and coordinating functions.

National rear services agencies, which are subordinated chiefly to defense ministries, general staffs and, in a number of cases, armed forces staffs, together with their subordinated storage complexes, arsenals, repair bases, hospitals and so on, basically have the tasks of purchasing (placing orders) and receiving materiel from industry, its centralized distribution, fulfilling the most complex repairs, treating casualties and patients requiring the most qualified care, and so on. This is why this level of the rear is often referred to as the base or wholesale level, on analogy with the economy. One of the tasks of national rear services agencies is to resolve the basic issues of organizing coordination with other bloc countries.

The strategic level of the rear of the NATO joint forces is made up basically of the central rear services agencies of the U.S. Armed Forces, which rely on that country's economic potential. NATO military specialists admit that armed forces rear services agencies of the European bloc are incapable of independently carrying out strategic missions owing to their limited resources and the insignificant depth of their territory, which is why they are fully dependent on the USA.

**The operational level of the rear** supports operations carried out by major formations within a certain part of a theater of military operations (a zone) and lasting from several days to several weeks. Coalition rear services agencies at the "army group—joint tactical air command (zonal joint forces command)" level and national organs of the zonal armed forces commands, field armies, army corps, territorial commands and others are created within it. The national organs of this level occupy an intermediate position between the higher and lower echelons of the rear. They support the receipt, preparation and advance of resources from central rear services agencies and sometimes directly from industry, and they perform the rather complex and laborious tasks of technical and medical support. Owing to the diversity of structures and views on the organization of this service, this rear level may not be singled out as an individual entity in some of the bloc's countries.

**The troop level of the rear** carries out the tasks of centralized distribution of supply and direct comprehensive support to the troops (forces). It is capable of supporting the combat activities of formations, units and subunits (ships) for a time interval from several hours to several days. This level of the rear is represented only by the national rear services agencies of divisions, brigades (regiments), battalions and formations equal to them. It is believed that it is the most mobile level, one associated directly with the fighting units and subunits. Western

experts compare the tasks it carries out with the functions of retail trade—breaking up stockpiles into parts of negligible volume, distributing them, and directly supporting a large number of consumers.

The foreign press emphasizes that the resources of the rear must be echeloned in accordance with their organizational membership and purpose. Thus the first echelons should contain only the supplies necessary for combat activities and the minimum composition of rear subunits so as to primarily ensure high mobility of the troops (forces). In this case expended supplies are to be replenished by means of fast delivery from rear areas. Casualties requiring qualified aid and prolonged treatment, and highly damaged equipment are evacuated there. The bulk of the supplies, services and organizations of the rear possessing the most complicated machinery and equipment are located in permanent installations a significant distance from the line of contact of the troops, thus ensuring their relatively high viability and security.

American central rear services agencies as well as agencies representing the supreme rear services agencies of European bloc countries (the FRG in particular), which organize acquisition and delivery of supplies to their armed forces, are located on U.S. territory. Even in peacetime, rear resources are echeloned in European theaters of military operations throughout the entire depth of the theaters in accordance with the plans for operations. One or several zones of combat activities and a communications zone are parceled out in each theater of military operations.

The zone of combat activities includes land and water areas and airspace within which troop (forces) groupings engaging in combat activities, forward units and rear services are located. It is bounded on the front by the line of contact, to the right and left by the boundaries of the theater of military operations or boundary lines between operational formations, and on the rear by the rear boundaries of army groups (field armies). The rear boundaries of army corps conditionally divide the zone of combat activities into forward and rear areas. The former includes corps, division and brigade rear areas, within which the corresponding resources are deployed. The rear area contains army rear services agencies or centrally subordinated agencies. The depth of the zone of combat activities may attain 200-300 km (for practical purposes it would encompass the territory of the FRG in the Central European theater of military operations).

The front boundary of the zone of communications contacts with the zone of combat activities and extends to a depth of 150-600 km or more (depending on the conditions of the theater of military operations). In turn, it may be subdivided into a forward, an intermediate and a base sector. In European theaters of military operations, the zone of communications is viewed as the binding link between the zones of combat activities and the territories of the USA and Canada. It contains many supreme coalition and national rear services agencies, and a significant part of the supplies stockpiled in European theaters of military operations, and troop and cargo unloading ports and airfields. The most important lines of communication pass through this area. If the depth of the theater is insufficient, a zone of communications may not be established.

Today, because the armed forces are furnished with fundamentally new weapon systems and military equipment, and because the spacial scope of combat activities has expanded and their fluidity has grown, the volume and complexity of rear support missions have risen dramatically while the conditions for carrying out these missions have concurrently grown worse. As is emphasized in one of the official American publications, supporting troops on an enormous battlefield saturated by weapons, military equipment, supplies and sensitive electronic systems is an "unprecedented problem," and this has reflected itself in the organization of logistic, technical, transport and medical support to the bloc's troops (forces).

**Logistic support** is intended to satisfy the swiftly growing needs of the troops (forces) for materiel in a time of simultaneous expansion of its assortment. This is confirmed in particular by the following figures. During World War I the daily materiel demand of a division was 65 tons, during World War II it was 675 tons, during the USA's aggressive wars in Korea and Vietnam it was approximately 1,000 tons, and in the recent Arab-Israeli wars it was 2,000 tons. Today according to estimates of Bundeswehr experts a West German tank division may expend as much as 2,800 tons of materiel per day in the course of intensive combat activities. The structure of the materiel demand is also changing concurrently owing to an increase in the proportion of ammunition and POL.

In accordance with the plans of the NATO command, in the initial period of war, logistic support of the bloc's troops (forces) is to be provided with stockpiles created in the theater of military operations during peacetime, and as the stockpiles are expended, with supplies brought up from the North American continent. In accordance with the requirements of the bloc's executive organs, in this connection 30-day stockpiles of the principal materiel, chiefly ammunition, POL, spare parts and food, must be created as a minimum in European theaters of military operations. Their specific dimensions are determined by the national commands on the basis of adopted expenditure norms, with regard for recommendations of the NATO military-political leadership. For practical purposes, however, according to the foreign press this requirement is being satisfied only in the USA and in the bloc's principal Western European countries.

Materiel is commonly subdivided into five classes in the armed forces of the NATO countries.

I—food and personal hygiene articles used in approximately the same quantities no matter what the situation or the terrain. They are issued on the basis of information on the number of personnel.

II—organic weapons, military equipment, engineering and medical stores, and spare parts and tools necessary for technical maintenance and repair.

III—all forms of POL, liquid gases, coolants and coal.

IV—supply articles not listed as organic (TOE) weapons, military equipment and gear, construction and fortification materials, special machinery and additional issues of class II supply articles. Materiel of these two classes is usually accounted for and processed together. Because of its high cost and often its uniqueness (spare parts, tools) or limited reserves (heavy equipment), this materiel is usually requested by special orders in each specific case, and its distribution is carefully monitored.

V—ammunition of all types, explosives, detonators, war gases. These articles (as with class III), which are expended in large quantities, must be replenished continuously (automatically on the basis of predicted or real consumption). Supply of nuclear ammunition is an exception—this is done by special American subunits on the basis of strict centralization. This ammunition is issued only after receipt of a special order, which can be issued only on the basis of a decision made by the military-political leadership of the USA and NATO. Automatic replenishment of expended ammunition of this sort is naturally not foreseen.

In order to simplify and unify accounting, storage and requisitioning of supply articles in the armed forces of the NATO countries, a unified materiel coding system has been introduced. In accordance with it, a 13-digit number and a brief description facilitating selection of standard and interchangeable materiel are ascribed to each article.

**Technical support** is directed chiefly at restoring a maximum possible quantity of weapons and military equipment in the shortest time. According to estimates of NATO specialists the losses of armored and other heavy equipment during the Arab-Israeli War exceeded the indicators of World War II by an average of four times. Considering these estimates, the losses of armored equipment in units of the first echelon of troops conducting combat activities (in a nonnuclear war) in the principal sectors of the Central European theater of military operations may be 25 percent per day.

Specialists of the U.S. ground forces adhere to the following principles when organizing armament repair in combat conditions. Work time on damaged equipment near the forward edge must not exceed 20 minutes. Equipment requiring around an hour for its restoration (including towing time) must be evacuated to the closest shelter 2-4 km from the line of contact. Repairs requiring up to 12 hours are to be carried out in battalion rear areas, those requiring 12-36 hours are to be carried out in brigade rear areas, and those requiring 36-120 hours are to be made in division and corps rear areas. Equipment requiring a longer time for its restoration must be evacuated further to the rear, or dismantled for spare parts. Weapons and military equipment are to be destroyed if their capture by the enemy is threatened.

Maintenance, repair and restoration are organized in the armed forces of the NATO countries on the basis of a unified system including troop, field and base repair. In this case all jobs are subdivided into four or five echelons depending on their complexity and the resources required.

**Transport services support** is directed at optimum use of all kinds of lines of communication employing military and civilian transportation in the interests of supporting military and, when necessary, commercial shipments. Supporting strategic transfers of troops (figures 1 and 2 [figures not reproduced]) and cargo from the North American continent to European theaters of military operations is said to be the most complex mission. As an example foreign specialists estimate that it may become necessary to transfer around 1.5 million personnel, 16 million tons of weapons, military equipment and ammunition and almost 25 million tons of POL from the USA to Western Europe in the course of several months, and additionally, to deliver up to 950 million tons of economic cargo to the bloc's European countries. Strategic transfers are to be carried out by a combined system: Personnel with light weapons and an insignificant fraction of the heavy equipment will be delivered by air, while the bulk of such equipment and supply articles will be transferred by sea. Nine hundred transport aircraft and vessels of the U.S. Navy's Military Sealift Command are to be utilized for this purpose; the Military Sealift Command may be reinforced by mobilizing the American merchant marine. Part of the merchant vessels of the NATO countries may also be used for this purpose. Subsequent shipments are to be supported by formation of a joint fleet of transport vessels of the NATO countries consisting of around 5,500 merchant vessels.

Presence of a developed network of highways and railroads and of a large fleet of motor vehicles in the European theater of war will make it easier to carry out military shipments within it.

The most widespread form of ground transportation at all levels of the rear is motor transport, which can be used to convey not only personnel and accompanying supplies but also the necessary equipment. In addition there are not less than 100 million passenger cars and 15 million trucks, 3 million trailers and 300,000 buses in the civilian sector of the bloc's European countries.

Rail transport (Figure 3) is believed to be an important means of mass shipment of oversized cargo, especially in rear areas. However, because of its greater vulnerability it must be backed up by other forms of transportation, chiefly motor vehicle.

Inland water transport, which has a strength of over 21,000 river vessels that can make extensive use of inland waterways (Figure 4) with a total length of over 23,000 km, may also play a certain role in shipments in the Central European theater of military operations.

Besides developing all forms of transportation and increasing their capacity, the USA and NATO commands are preparing stockpiles of weapons and military equipment. Thus stockpiling of heavy weapons and military equipment for six American divisions and for combat and rear support units and subunits is nearing completion in the Central European theater of military operations on the basis of the POMKUS [not further identified] program (prestockpiling of weapons and military equipment in application to the strength of formations and units). There are plans for making the rear services of host countries (chiefly the FRG) participate more extensively in rear support to coalition troops.

**Medical support** is organized with the purpose of prompt provision of qualified care and return of the maximum possible quantity of casualties to action in the presence of major losses. It is believed that a high level of medical support not only helps to preserve manpower but also has a strong influence on the personnel's fighting spirit.

The resources of the medical service are located throughout the entire depth of a theater of military operations, from the forward edge to the zone of communications, usually in three or four echelons. In each of them, casualties receive the necessary assistance and are prepared for further evacuation to the rear (including the continental USA). Fighting subunits and units possess resources for collecting casualties and rendering first aid, paramedic assistance and aid station treatment. At the division level, qualified assistance is provided chiefly on the basis of vital indications (over 30 percent of the medical losses). The rest of the casualties are evacuated further to the rear using all forms of transportation (Figure 5).

In the opinion of NATO specialists reduction of the time it takes to deliver casualties to a medical station where they would receive qualified care will have decisive significance. In this case aid station treatment is to be provided no later than 30 minutes after injury, while emergency qualified care is to be provided not more than 6 hours after injury.

The NATO command attaches great significance to keeping rear services agencies in a state of high combat readiness. The system of operational and combat preparation of NATO joint forces allots an important place to exercising the bloc's troop rear support functions. During exercises and operational readiness inspections, practically the entire complex of measures involved in shifting the rear from a peacetime to a wartime posture and in comprehensively supporting the bloc's armed forces—measures which will have to be carried out in the course of strategic deployment and during conduct of combat activities—are practically exercised.

Thus according to the foreign press NATO has formulated the theory and practice of organizing rear support of coalition armed forces groupings ensuring adequately effective mobilization and utilization of all resources of the bloc's countries in the interests of these forces. It is believed that presence and the possibility of using developed, highly productive rear support systems and the strong economic potential of the bloc's leading countries, chiefly the USA, will promote successful completion of these missions. At the same time it is pointed out in the Western press that a large number of factors may have an unfavorable influence on the effectiveness of rear support to NATO joint forces: imperfections in integrative processes, differences in the capabilities of rear services and the economies of the leading and other countries of the bloc (this difference is observed to be especially great on the bloc's southern flank, where the armed forces of the member countries can be supported only if assistance is provided to them from without), the great length and relatively high vulnerability of trans-Atlantic lines of communication connecting the main base of the bloc's rear to the principal armed forces groupings, and the insignificant depth and geographical isolation of European theaters of military operations. It is also noted that the level of development and equipment availability of rear services fall short of the rate with which the armed forces are being saturated with weapons and military equipment of a new generation, and that there is too high a proportion of reserve components and a shortage of trained reservists, chiefly for the medical services and for the crews of merchant vessels after they are mobilized.



## The Military Aspect in the Development of Bioengineering

*18010215c Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 16-20*

[Article by P. Akimov]

[Text] Owing to the efforts of the USSR and other socialist states, a convention prohibiting the development, production and stockpiling of bacteriological (biological) and toxic weapons and calling for destruction of such weapons was signed in 1972. This convention was supported by the USA and other leading NATO countries. Despite this, Western military specialists continue to devote special attention to the role of these types of weapons in modern military conflicts.

They share the opinion that their use in armed conflicts in conjunction with a simultaneous mass campaign of disinformation will make it possible to achieve a certain degree of military success. It is believed that through

wide use of toxins and the agents of dangerous infectious diseases, panic could be created in the enemy's rear, mobilization could be disrupted, the work of administrative and political centers can be paralyzed, and the combat capability of the regular army can be undermined.

The U.S. Defense Department is advertising and, to a certain extent, carrying out research and development programs having as their immediate objective the improvement of traditional bacteriological and toxic weapons and development of their production, as well as more intensive preparation of troops for combat activities in the face of their use. The long-range objective of these programs is a transition to a fundamentally new generation of bacteriological and toxic weapons based on contemporary accomplishments of molecular biology.

In the 1970s, successes in molecular biology, genetics, immunology and associated disciplines laid the basis for a scientific revolution that has affected all biological sciences, including bioengineering. Within a short time, an artificial human hormone—insulin—was obtained for the first time by the methods of bioengineering, to be followed by interferon, human growth hormones, blood coagulation hormones and other physiologically active substances, including many enzymes and proteinaceous drugs. According to statements by foreign scientists the areas of application of bioengineering are extremely wide today, and they are not limited to the interests of public health, production of new materials and products, power engineering, metallurgy and so on. The only limits to its application are the imagination of scientists and their capacity for fantasy.

One distinguishing characteristic of the scientific revolution in bioengineering is not only swift expansion of the limits of what scientists understand about vital activities, but also immediate commercialization—that is, continual reduction of the gap in time between a scientific discovery and its introduction into production. According to reports in the American press the Pentagon has not ignored the new scientific and technological accomplishments. Forms of activity permitted and prohibited by the 1972 biological convention remain closely associated in this case.

A new direction called "Bioengineering" was established in the program of military research and development in the USA; this new direction is receiving continual attention and support. For example bioengineering research in behalf of ground troops is being carried out under the guidance of the U.S. Army's Medical Research and Development Command (U.S. AMRDC), which is directly responsible for introducing the accomplishments of bioengineering into the troops. Fourteen specialized laboratories are occupied with such research and development in the U.S. Army; five of them are operating outside the USA (Egypt, Thailand and other countries).

The main scientific centers of the USA in this area are the Walter Reed Scientific Research Institute and the U.S. Army Medical Institute of Infectious Diseases. Both of these institutions carry out both their own and contracted development in various spheres of application of bioengineering. The navy's scientific research directorate is carrying on molecular biology programs for what I refer to as nonmedical purposes. The foreign press reports that similar research is also being conducted in France, Great Britain, the FRG and other NATO countries.

Why are the military departments of NATO countries so interested in research in this area?

The revolution in bioengineering occurred and is continuing to evolve owing to development and practical introduction of the methods of genetic engineering, protein engineering and monoclonal (strictly homogeneous) antibodies.[1]

The concept of genetic engineering includes a complex of methods of purposeful alteration of a cell's DNA (genome) through introduction of additional structural components (nucleotides) into it or their removal from it. Special enzymes capable of reproducibly "cutting" a DNA molecule into parts at precisely targeted points were found for these purposes. And on the other hand other enzymes can be used to splice them together in a different order—that is, to obtain artificially constructed (recombinant) DNA. It was found possible to insert, into the nucleotide sequence of a cell's genome, not only elements (genes) of the native DNA bearing the corresponding genetic information, but also genes from DNA of distantly related species and even of representatives of other living beings. Methods of organic synthesis of a sequence of nucleotides not encountered in nature, which can also be introduced into the gene of a recipient cell, have been developed.

Recombinant DNA was obtained for the first time in 1973, when a gene from the DNA of one cell was introduced into the gene of another cell, with the latter retaining its capacity for multiplication by means of division. So it was that the possibility for designing new cells and of naturally unknown viruses, bacteria, yeasts, microscopic fungi and so on was realized.

Back in 1970 Nobel Prize recipient Joshua Lederberg cautioned that the accomplishments of molecular biology could be used for military purposes, which would result in a biological arms race. In his estimation it was entirely possible that such weapons could be a most effective means of completely destroying the planet's population. He also noted that the modern methods of genetics and chemistry provide a possibility for developing (creating) new pathogenic microorganisms against which no dependable protection of any kind could be found.

In view of shortcomings inherent to them, infectious disease agents encountered in nature do not satisfy American military specialists as potential biological agents of military significance. However, the methods of genetic engineering have made it possible to adjust the properties of pathogenic microorganisms. This means raising their resistance to environmental factors (air humidity and temperature, solar radiation) and their survivability. Obviously growth of the viability of pathogenic microorganisms in the atmosphere would increase the area of affliction of people and provide a possibility for their combat use at any time of the day and year. The second way of correcting the properties of microorganisms has to do with raising their resistance to antibiotics and other medicinal agents, so that it would be difficult or impossible to treat infected people, and so that mortality would be increased. Attempts at altering pathogens in such a way as to distort the signs of disease and thus make timely diagnosis difficult pursue the same goals.

It was reported in the foreign press that the issue of altering the properties of anthrax bacilli has been raised. Their capacity for spore formation is often an undesirable property, since the area to which they are applied may remain dangerously infected for many years. But if a modification of this bacillus deprived of the property of spore formation were to be obtained artificially, it could be used in any region, since in this case the time of natural disinfection would be acceptable.

Special specimens (strains) of agents of especially dangerous infections were developed at the request of the Pentagon in the late 1970s. These agents are capable of not only surmounting the immune system but also acting upon its key components, destroying them and thus making the organism more susceptible to a broad spectrum of agents of both commonplace and unusual diseases.

According to the Western press the USA is doing work on "superviruses" with lethal action that is incomparably more pronounced than that of all viruses and bacteria known to man thus far. Toxin formation by pathogenic microorganisms may be both increased and weakened by the methods of genetic engineering. In the former case this could lead to an increase in the injurious action of the biological agent. In the latter, a microorganism with its capacity for toxin formation gone would retain segments on its membrane possessing properties of an antigen that stimulates an immune response of the same magnitude as would a natural pathogen. This creates the conditions for using the altered microorganism as a live and extremely effective vaccine. Thus the gene responsible for immune protection against Rift Valley fever was successfully introduced into a smallpox vaccine virus, which resulted in a live recombinant vaccine that had a sufficiently high protective effect on animals in preclinical experiments. It is felt that live recombinant polyvaccine offering protection simultaneously against several biological agents may be obtained.

Toxin sources (producers) include plants, fish, reptiles, bacteria, viruses and other microorganisms. The amount of toxin they contain is negligible. It used to be impossible to accumulate such toxins in large amounts, which is why many of them were not considered as weapons even though the damage they inflict is very high. The modern methods of bioengineering, in the opinion of Pentagon specialists, are changing this position fundamentally.

Toxin synthesis is programmed in the genome of producer cells. Bioengineering makes it possible to isolate the gene responsible for toxin synthesis and to transplant it from a producer cell to the genome of other cells capable of rapid multiplication and maintaining viability when cultured outside the organism. In this case intense toxin formation may begin in the recombinant cell. American specialists feel that there is no need for accumulating toxin reserves ahead of time, since they could be manufactured at the needed moment and in the needed quantities.

Thus for example one goal that has been set is to introduce the corresponding genes into the genome of Escherichia coli so that the mutant microbe would be capable of generating cholera, diphtheria and botulism toxins or other highly toxic substances, in the same way that human insulin or interferon is being produced today by means of the same E. coli. Toxins and poisons are transforming from inaccessible materials to ones fully suited to mass production, and consequently they may join the ranks of other forms of toxic weapons.

Most of the work has been done on the methods of obtaining peptides—chains of chemically bound amino acids. As we know, synthesis of every amino acid in the genome is coded by strictly determined combinations (triplets) of nucleotides. If the amino acid sequence in a peptide is established (there are automatic systems capable of doing so), a nucleotide sequence coding the synthesis of a given peptide may be built and then synthesized. This sequence may be introduced into the genome of a saprophytic (nonpathogenic) microorganism, owing to which the latter transforms into a microfactory producing a polypeptide inside the human body.

In turn, natural substances are encountered among polypeptides (neuromediators) which allow transfer of nerve impulses and other interactions between cells. Even the slightest interference in their synthesis or breakdown in the body causes important biosystems to fail, such that loss of memory, loss of the ability to learn and think, disturbances in motor coordination and other behavioral disorders may result. Modified microorganisms producing these substances in the course of their vital activities are viewed by specialists of the U.S. Defense Department as resources capable of eliciting a feeling of false pleasure or dulling of the consciousness of persons required to make critical decisions. Neurotoxins that evoke a feeling of fear, fast loss of consciousness and

even paralysis are also encountered among polypeptides. Polypeptides are distinguished by highly selective action, and they hit strictly determined cells, which is why their toxicity is especially high.

The protein technology described here can be used to obtain active polypeptides which would be capable of causing a loss of performance in enemy troops or putting them into a stressful state under certain conditions. The programs of the U.S. Army's medical service foresee creation of polypeptides that enhance the impact of treating wounds, burns, shock, blood infection and acute renal insufficiency, and polypeptides that can be used as preservatives of blood and blood substitute components.

The U.S. Naval Department is investigating methods of protein engineering for synthesizing polypeptides and proteins suited as biocatalysts that are difficult to obtain from natural sources. Doctor G. Koran [transliteration] and his associates from the Massachusetts Institute of Technology are studying protein from the membranes of bacterial and animal cells capable of absorbing light on the basis of a contract with the Naval Department. The Aguron [transliteration] Institute in San Diego, California is studying the enzyme dehydrophtholate reductase, and the California Institute of Technology is studying the enzyme lactamase, responsible for breakdown of penicillin in the body. Specific mutagenesis is a method making it possible to substitute certain amino acids in protein molecules by others, which opens up wide possibilities for studying the relationship between the structure of such proteins and their properties. The end goal of this work is to create methods of computer design of proteins with prescribed properties. Model proteins are being synthesized to study the relationships between amino acid sequences and their three- dimensional structure. It is believed that this approach is more progressive in terms of obtaining proteins and polypeptides with the needed properties than the approach based on modifying the structure of existing ones. Experts of the U.S. Navy hope to employ protein engineering in a wide range of production processes, beginning with selective fine chemical synthesis of substances and ending with destruction of large amounts of toxic chemical substances and decontamination of the environment.

Bioengineering is being used in the U.S. Navy to create new materials. For example an adhesive material (a glue) was isolated from the byssal threads (attachment) of bivalve mollusks. It is a relatively simple protein (a decapeptide) containing several amino acids having hydroxyl (OH) groups in their composition, including dioxyphenylalanine and hydroxyproline. An attempt is being made to obtain an especially waterproof glue for the navy's needs out of this protein. Efforts are being undertaken to synthesize a low molecular oligonucleotide coding formation of the indicated decapeptide or other biopolymer containing up to 200 amino acids. This synthetic gene is to be introduced into a suitable microorganism for production of the adhesive in sufficiently large amounts.

The program for creating new materials by the methods of bioengineering foresees a number of directions: studying biomineralization of the shells of marine mollusks in order to create composite materials, and binding of antibodies with optical fibers in order to develop new types of detectors of chemical substances; studying unique magnetic properties of liquid crystals based on derivatives of organometallic compounds (porphyrins); acquiring enzyme systems by which to extract strategic metals from poor ore.

Significant successes have also been achieved in the area of obtaining and utilizing monoclonal antibodies—homogeneous protein structures capable of strictly specific interaction with certain microorganisms or a certain substance of both endogenous (internal) and exogenous (external) origin. The Pentagon plans to set up production of diverse monoclonal antibodies serving the most varied purposes. They are intended chiefly for use in quick diagnosis of diseases and intoxications, and in identifying microorganisms and toxins. Monoclonal antibodies are being studied as potential antidotes to the poisoning of people by toxins, war gases and other poisons, and as resources by which to treat and prevent infectious diseases. In the opinion of American specialists these remarkable antibodies may be used successfully to study the spread of infectious disease agents or toxins in the human and animal body. This also pertains to research on duplication of a pathogen inside a patient's body. American military laboratories attach important significance to understanding these processes, inasmuch as they have a direct bearing both on development of the ways to enhance the infectious properties of known microorganisms and on creation of more effective vaccines and pharmacological preparations.

Monoclonal antibodies can also be used for preparative purposes, inasmuch as they can be used to isolate individual substances from complex mixtures. Development of monoclonal antibodies intended to detoxify war gases and toxins settling in the eyes, on the face, in the oral cavity and on the skin of people, and ones existing in various media and on various objects, has been foreseen as a specific item of research.

But at the same time military specialists are using monoclonal antibodies to study the immune system; in this case the purpose of this work is to create resources by which to suppress it.

Monoclonal antibodies are capable of entering into a conjugation (molecular bonding) reaction with various toxins and other physiologically active substances, and delivering the latter to a strictly determined receptor or other biological target. The properties of these conjugates, which have come to be called immunotoxins, are being studied in detail in the USA as potential agents of a military purpose—a new variant of toxic weapons.

Judging from reports in the foreign press, the Pentagon is seeking ways to achieve actual possession of bacteriological and toxic weapons of a new generation. Despite protests from the public and even from some Congressmen, in February 1988 the U.S. Army Department decided to build a new maximum security laboratory in the Dugway Proving Grounds, Utah in order to conduct experiments with especially dangerous biological agents. It is believed that this newest laboratory is intended to test biological agents designed at the request of the U.S. Defense Department in genetic engineering laboratories. Nor is it accidental that allocations for the development of biological weapons increased almost sixfold in the last 5 years.

**Footnote**

1. Antibodies—proteinaceous particles generated by the body's immune system to neutralize pathogenic microorganisms and toxins.—Editor.



## NATO's European Group: On the Course of Militarization

*18010215d Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) p 20*

[Article by Lt Col M. Kashirin]

[Text] NATO's militaristic circles are unhappy with the growing momentum of improvements in the international situation, since reducing the level of confrontation between the North Atlantic alliance and the Warsaw Pact is one of the most important directions of such improvement. Evidence of this can be found in the plans of the bloc's military- political leadership to "compensate" for medium and lesser range missiles eliminated in accordance with the Soviet-American treaty, and in NATO's programs for increasing the arsenal of nuclear and conventional weapons.

NATO's European group (Belgium, Great Britain, Greece, Denmark, Spain, Italy, Luxembourg, the Netherlands, Norway, Portugal, Turkey, the FRG), is playing an active role in this. Its armed forces, which have a strength of around 2.5 million men, are the backbone of the bloc's general purpose forces in Europe in peacetime. Ignoring proposals from socialist countries on bilateral reduction of the armed forces of both coalitions on a mutually acceptable basis, the governments of countries in the European group are not weakening their efforts directed at strengthening NATO's "European core," and they are continuing to arm their armed forces with modern weapons and military equipment at an intensive rate. According to information published in the Western press, in 1988 the ground troops of these states will receive (additionally and as replacements) 250 tanks, over 1,000 armored vehicles, more than 50 large caliber artillery systems, 350 antitank guns, 400 Milan and TOW antitank guided missile systems, around 10,000 shoulder-fired antitank rocket launchers and up to 70 army helicopters. Efforts to modernize tanks including installation of new fire control systems and improved armor protection will be continued concurrently.

Around 200 modern warplanes (predominantly the Tornado and the F-16) will enter the air units of the air forces of these countries, and around 40 new surface-to-air missile systems will be introduced in order to reinforce airfield air defense. There are plans for implementing measures to modernize existing airplanes. In particular airplanes are to be outfitted with modern detection receivers and instrumentation for electronic suppression of air defense weapons as a way of raising their capabilities for penetrating air defenses.

There are plans for introducing three submarines, seven frigates and five mine warfare ships, patrol craft and auxiliary vessels into the effective strength of the navy. Up to 25 airplanes and helicopters will be added to the inventory of naval aviation. Ships will continue to be outfitted with modern control, communication and reconnaissance systems and with radar and sonar stations.

These militaristic preparations evoke serious concern on the part of sober-minded politicians of Western Europe who feel that increasing the fighting power of NATO armed forces may make it difficult to normalize the situation on the continent.



## Sniper Rifles in Armies of Capitalist Countries

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[Article by Lt Col (Res) A. Chekulayev, candidate of technical sciences]

[Excerpts] The actions of snipers are viewed abroad as one of the independent forms of troop combat activities by means of which certain combat missions are carried out.

Tactical use of snipers may assume different forms depending on the strength of the opposing enemy, the type of combat (defense, offense), the nature of the terrain and a number of other factors. There are two conceptions in this connection. According to the first, snipers operate singly or in groups of two with the sole mission of killing enemy servicemen on their territory in direct proximity to the front line or in the immediate rear. According to the second conception, a sniper group

consisting of two observers and four to eight riflemen operates as a sniper-reconnaissance patrol. It contains the enemy's actions and reports on his movements and his fire plan.

It is noted in the foreign press that the principal missions of snipers are to demoralize the enemy, to limit movement of enemy personnel in their own immediate rear, to force the enemy to build shelters, communication trenches and other structures, to prevent infiltration of the neutral zone and the front line, and to protect military installations such as airfields, depots and so on. In addition inasmuch as snipers are observers, they may also be used to indicate targets by means of tracer or incendiary bullets. One of their most important missions is to fight enemy snipers.

The missions indicated above are carried out by disabling command personnel, forward observers, weapon crews and individual soldiers and officers. To ensure success, all of this must be carried out completely unexpectedly by snipers invisible to the enemy.

In distinction from an ordinary infantryman, a sniper should be located as a rule at a separate, carefully camouflaged and concealed position, and he must be able to keep the enemy under observation for a long period of time, so as to select the most appropriate target. Then, patiently, without revealing himself by movement or noise, he awaits a convenient moment to hit his target, with the first shot. Effectiveness is highest when a person who is not on the forward edge but who is as far away from it as possible and who feels himself to be in complete safety is suddenly hit. This means that the target must be hit from considerable range as a rule.

According to modern requirements a sniper's weapon (rifle) and ammunition should hit a live target at a range of up to 900 m. In this case there should be a high probability of a hit with the first shot on a waist figure target at a range of up to 600 m and a chest target at up to 400 m. Neither weather nor climatic conditions nor barrel temperature nor the condition of the weapon itself (be it clean or dirty) should affect fire accuracy. All revealing factors—smoke, flame, the sound of the shot, clanking of the bolt during reloading and the noises of moving parts of an automatic weapon striking each other—should be minimized. These are the principal requirements which, if not satisfied, would make the weapon and ammunition unsuited for use as a sniper's equipment.

In addition to these requirements, a number of others are imposed on a sniper's weapon and ammunition: A sniper's rifle should have a structure convenient for fire from different positions, and it must be relatively small and light. Sights must permit prolonged observation without tiring the eyes. The sight must be secured well, and quick exchange of day and night sights must be permitted. It would be desirable for a sniper's rifle to be used with identical convenience when firing point-blank both from the right and from the left shoulder, and the trigger pressure should be adjustable and fully definite. The recoil should not exceed 3 kg. But on the whole, the requirements imposed on sniper's rifles and ammunition are directed at raising the accuracy and effectiveness of fire, the dependability of the weapon's operation, including in extreme conditions, and maximum convenience of its use.

The effective range and accuracy of a sniper's rifle are determined chiefly by the quality of the ammunition. In this case this implies not only the carefulness of its manufacture but also the entire complex of the cartridge's characteristics, including the weight and shape of the bullet, its muzzle velocity and so on.

Most foreign sniper's rifles presently use the standard 7.62x51-mm NATO cartridge. Its bullet (which weighs 11.2 gm) has a streamlined base that imparts a high ballistic coefficient to it at a muzzle velocity of 777 m/sec. The effective range of fire of this bullet at this muzzle velocity is estimated at 600 m at a hit probability of 70 percent. Given a muzzle velocity of 945 m/sec, the sensitivity of the same bullet to a sidewind is approximately 25 percent less, and the effective range of fire increases to 750 m, but this is still not as high as required—900 m.

Foreign specialists feel that there is a possibility for increasing the ballistic coefficient of the bullet by increasing its weight while reducing its total length. This would require the use of a slug made from a metal denser than lead. The transverse load increases and decelerating forces decrease as a result. A higher recoil may be the limiting factor in this case. However, if we consider that as a rule sniper's rifles are much heavier than usual, the increase in the recoil resulting from a heavier bullet should not be impermissible.

In the opinion of Western experts cartridges with lighter bullets, such as the standard 5.56x45-mm NATO cartridge, cannot generally be looked as ammunition for sniper's weapons. They feel that a special cartridge more powerful than the standard 7.62x51-mm NATO cartridge should be designed for this purpose. Moreover they emphasize that the demand of the ground troops for special sniper's ammunition will be negligible, and that there would be no difficulty in producing it and then supplying it to snipers.

Until recent times, ordinary rifles distinguished by more careful manufacture and selection, and by presence of optical sights, have been used as a rule as sniper's weapons. The experience of their combat use and research by foreign specialists have shown that the success of snipers also depends significantly on the design of the sniper's rifle, the requirements on which differ fundamentally from those imposed on ordinary rifles. The chief requirement of the latter is a rate of fire of 30-40 rounds per minute. Therefore they are made automatic or self-loading (semiautomatic) as a rule.

Snipers fire their weapons exclusively in single-shot mode following meticulous sighting. Under these conditions the advantage of automatic loading—an increase in the rate of fire—loses its significance, and it creates certain inconveniences because movement of parts of the automatic action in response to a discharge reduces the accuracy of fire, and the noise created by the parts striking each other reveals the sniper's position. This is why it would be preferable to use a rifle featuring manual reloading, which would ensure a higher accuracy of fire and which would involve almost no noise at all.

High accuracy of fire is determined by the design of the barrel of the sniper's rifle. Thicker walls make it less sensitive to temperature changes and to possible differences in cartridge characteristics. Moreover the length of the barrel must be increased in order to make fuller use of the ballistic capabilities of the ammunition in relation to the effective range of fire. Thus a sniper's rifle needs a longer barrel with thicker walls, which noticeably increases its weight. Foreign specialists feel that the optimum barrel length for a 7.62-mm sniper's rifle is 650 mm, which in combination with a classical manual breachblock makes the overall length of the weapon around 1,200 mm together with the flash reducer.

The weight, strength and rigidity of the stock has an effect on the accuracy of fire of a sniper's rifle. This is why special attention is turned to its material and its structure. A walnut stock impregnated with epoxy resin or a high-strength plastic stock are preferred.

The accuracy of fire also depends on uniformity of action of the trigger mechanism. Therefore as was noted above, it would be desirable to have the possibility for adjusting the tightness of the trigger and to ensure constancy at a selected value. It is felt that for safety considerations it should be not less than 2 kg.

The choice of sighting devices has special significance to sniper's rifles; moreover the requirements on them are very contradictory as a rule. Thus the optical sight of a sniper's rifle must allow observation and fast detection of a target, which requires a great field of view and consequently a low magnification. On the other hand this sight must allow good visibility of the target at long range, which requires high magnification, which sharply reduces the field of vision.

High strength guaranteeing maintenance of adjustment in rough operating conditions, including in the presence of accidental blows, is required of the optical sight of a sniper's rifle. Fulfillment of this requirement must be combined with possession of a variable degree of magnification. Optical sights capable of 3x to 9x magnification are widely used today. However, foreign specialists feel that for fire at ranges of 800 m or more, it would be more preferable to have magnification varying from 4x to 12x.

The USA has made several attempts at raising the range of fire by increasing the caliber of the sniper's rifle to 12.7 mm, using the 12.7x99-mm M2 machinegun cartridge. However, two problems always arise in this case. First of all the bullet of this cartridge, which weighs 46 gm, deviates a significant angle when fired at long range. And while for a machinegun this may be satisfactory, it is unacceptable for a sniper's rifle. Second, with such high caliber, the rifle must be very heavy in order to absorb the recoil energy.

Nonetheless America's Barrett Firearms Manufacturing has developed and is producing the M82 12.7-mm self-loading sniper's rifle (Figure 8 [figures not reproduced]), which satisfies the requirements of the U.S. Army Department imposed on special application sniper rifles (SASR). Its action is operated by a short barrel recoil. The barrel possesses reinforcing and cooling ribs and a double-chamber muzzle brake that reduces the recoil by approximately 30 percent. The overall length of the rifle is 1,575 mm (that of the barrel is 838 mm), and it weighs 16.1 kg. The capacity of the magazine is 11 cartridges. A folding bipod is secured toward the front of the stock.

The M82 is equipped with a 10x telescopic sight. According to the developing company the greatest scatter between aiming points and points of impact for this rifle at a range of 2,000 m is not more than 51 cm.

Noting one of the main shortcomings of the M82—its high weight, American specialists concurrently point out that it can be used for aimed fire against airplanes and helicopters (at airfields), surface-to- air missile systems, control posts and fuel and ammunition dumps using incendiary bullets, and against lightly armored vehicles when using armor piercing bullets. According to the Western press such bullets can penetrate armor 19 mm thick at a range of 1,200 m.

Another American company—Research Armament Industries—designed the M500 12.7-mm sniper's rifle and the M300 two-caliber rifle. The former was intended for the U.S. Marine Corps. It has a long heavy barrel with longitudinal reinforcing and cooling ribs and with a double-chamber muzzle brake. The rifle has a free-floating barrel in order to increase the accuracy of fire. It is loaded one cartridge at a time—there is no magazine. Its weight (without the sight) is 13.6 kg.

The M300 two-caliber (7.62-and 8.58-mm) sniper's rifle proved itself to be much more effective than the M500 in firing tests. The caliber of its main variant is 7.62 mm (to fit the standard NATO round). It transforms into a variant accommodating the special 8.58x71-mm cartridge simply by replacement of the barrel, the bolt head and the feeding device. The bullet of this cartridge weighs 16.2 gm. Its velocity at a range of 1,500 m is 1.5 times greater than that of the bullet of a standard 7.62x51-mm NATO cartridge, and its kinetic energy is almost 3 times greater. Moreover the scatter of the points

of impact does not exceed 20 cm at this range. The possibility is not excluded that the M300 sniper's rifle will be adopted by the U.S. ground troops after some final adjustments.

It should be noted that many foreign specialists feel that creation of 12.7-mm sniper's rifles is unfeasible owing chiefly to their great weight and their unsatisfactory accuracy of fire. In their opinion a caliber of 8.58 mm would be more promising. However, they do not exclude the idea of improving the traditional 7.62-mm caliber sniper's weapon and ammunition.



## New Procedure for Psychophysiological Selection of Pilots

*18010215f Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 36-38*

[Article by Col L. Monin]

[Text] The continual improvement of aviation equipment and the growing complexity of its missions are imposing increasingly greater requirements on the physical and psychophysiological qualities of flight crews. The problems of selecting candidates for flight schools are acquiring decisive significance under these conditions. In the opinion of foreign aviation experts the existing selection system is not entirely perfect, since the occupational selection resources and methods that do exist fail to reveal all of the psychophysiological features of the personality within the time allotted to examining the candidates. Mistakes made by psychologists may cost dearly, and not only because persons who are not psychologically fully compatible with the occupation are accepted for training, or as a result trained pilots would be poorly qualified, but also in the material sense. Thus according to the London Institute for Strategic Research, it costs an average of $8 million to train one fighter pilot in NATO countries. The cost of training pilots for some other aircraft (for example helicopter gunships, heavy warplanes and transport aircraft) turns out to be still higher.

In the last decade and a half, foreign specialists in psychology and aviation medicine have carried on a search for new, improved procedures of occupational selection that would make it possible to predict, with a greater probability than now, the behavior of subjects in particular situations, and to offer conclusions as to the suitability (or unsuitability) of their training as military pilots.

A special center for testing the fitness of candidates for flight activities which was opened in April 1986 at a military hospital in Vienna has attracted the attention of Western experts. This center employs a new procedure for psychological testing of candidates, developed by associates of Vienna University's Institute of Psychology. It differs from that previously employed both conceptually and in relation to the equipment used.

Addressing the innovations introduced by the testing equipment, the foreign press reports one of them to be rejection of the traditional approach that may be expressed as "one instrument, one test." Various apparatus and devices of varying complexity are replaced by a single computerized diagnostic and testing system that can not only carry out various experiments on the basis of a prescribed program, process the results and assign the appropriate scores, but also control the course of the experiments themselves, flexibly and efficiently making changes and corrections in them depending on the subject's psychophysiological indicators (see figure [not reproduced]). The latter are revealed by sensors secured to the body, and in the course of computer analysis of the actions of the candidate and his motor reactions to particular test assignments. For this purpose the system contains a reaction checking unit and a set of various programs which can be selected and used depending on the specific requirements imposed on the subject.

Foreign psychologists are specially interested not in the center's equipment but in the procedure it employs. They feel that a knowledge of the psychophysiological status of a serviceman is required before his behavior in stressful situations can be predicted. The information needed for such diagnosis had been obtained earlier as a rule on a neutral background—that is, with all interference and stimuli excluded to the extent possible. It was adopted as an axiom that whatever the situation, the "effectiveness" of the personality (swiftness of reactions, correctness of estimates of a situation and of decisions, and so on) decreases in response to a stressful load. In simple terms the task of the psychologist was to try to predict how much the subject's "effectiveness" would decrease in a real situation as compared to results obtained on that neutral background. In this case specialists relied only on theory and on their own experience. Many of them who had doubts about the absolute correctness of the axiom attempted to model real situations in the course of testing. But in this case Western experts feel that there is a great danger of extrapolating the results for a subject in a modeled situation to real situations, which is not always justified. In addition when the assessment is subjective and the psychologist relies chiefly on his own experience, the possibilities of unintentional falsification or tailoring of test results are boundless.

It would seem that it would be extremely suitable to use an examination procedure based on comparing the results for the same individual tested first in a relaxed and then in a stressful situation, and then revealing the specific psychological parameters of his "effectiveness." However according to foreign experts such a procedure has not yet been used consistently in aviation, though this method has been around a long time in sports psychology. Athletes who take the same tests in a calm

situation and then in the presence of a physical load (on a bicycle ergometer for example) produce results differing in both magnitude and sign. Psychophysiological parameters declined in response to a load in some of them, while in others they increased (sometimes significantly). The latter contradicted the prediction based on prevailing conceptions.

In order to sooner reveal persons whose performance declines abruptly in extreme conditions, Austrian psychologists began using comparative testing of candidates in a neutral situation and under a load in pilot selection; they called the latter "ergopsychometry" (on analogy with "ergometry," well known in medicine[1]).

One other distinguishing feature of the new procedure is that it considers a number of human biological parameters, and chiefly the electrical potentials of individual portions of the cerebral cortex, and their active participation in the testing process itself. In regard to the former, the Western press notes that rather sizable negative electrical potentials are recorded in certain sections of the cerebral cortex of an individual in a state of heightened attention and readiness to act, while small values of these potentials indicate a reduced level of psychophysiological preparedness (the individual's nervous system and entire body are in a relaxed state). In this case when a need to react arises suddenly, the possibility for wrong actions noticeably grows. This principle was laid at the basis of testing done by the new procedure.

The subject carries out an assignment, though not on the basis of a program previously known to him but in response to computer commands. The computer, which constantly records potentials from different sections of the subject's cerebral cortex, transmits to the display a signal or a new assignment as soon as it detects a noticeable change in bioelectric activity, in one direction or the other depending on the program it is running. The nature of change of potentials determines the subsequent course of examination. In the opinion of Austrian psychologists, after a series of such experiments are carried out it is possible to reveal with greater dependability how the given individual experiencing different states of mental activity reacts to changes in a situation.

One other important indicator revealed in the course of such tests is the individual time necessary to achieve a transition from heightened activity to a state of rest (to the background value of electrical potentials).

The program of psychological examination of pilot candidates based on the new procedure include tests pursuing different goals. In particular they reveal so-called sensomotor coordination—that is, interaction of the processes of perception through sense organs with motor functions of the body. It is assumed in this case that the most important relationships to the pilot are "eye-hand" and "eye-hand-leg." It is emphasized in the foreign press that these tests can be used not just to determine the subject's capability for coordinated actions, but also to do this with regard for the hierarchy of reactions of a subject affected simultaneously by several stimuli. Additional physical and mental loads may be introduced together or simultaneously as "aggravations" in the course of acquisition of ergopsychometric characteristics. For example the coordination task may be made more complex, or it may be structured such that thinking, decision making and action must be practically simultaneous.

Another group of tests used in the new procedure are directed at determining the capacity of subjects for tracking the trajectory of moving objects and predicting it (in place and in time). Formerly, spatial imagination, which is one of the classical characteristics of intellectual capability, was tested with paper and pencil as a rule. This method often provided unobjective impressions of the capabilities of subjects, inasmuch as the approach of many of them to solving such problems differed significantly from what was anticipated. Austrian specialists feel that a very good result can be achieved by using a purely logical and analytical approach, though in this case the subject may be lacking an adequate capacity for solving spatial problems by means of imagination close to direct perception—a characteristic extremely important to the work of a pilot. With computers it has become possible to offer spatial perception problems which would require the subject not simply to be logical but to "immerse" himself into the situation. Concurrently with this, traditional assignments requiring work with pencil and paper are not excluded. Comparison of the results of tests carried out by the two procedures indicated above produces the optimum result.

The foreign press reports that Austrian specialists devote considerable attention in selecting pilot candidates to revealing their capability for critically evaluating their own possibilities and determining permissible risk. With this end in mind, the subject is offered a sensomotor problem having a solution requiring not only the ability to act but also the capacity for reasonable risk. In this case the subject himself selects one out of several "risky moves," each of which may earn him a certain number of points. The higher the risk, the larger the number of points he may earn, but the danger of failure grows proportionately as well. In a series of attempts the candidate has the opportunity to evaluate and adjust his own risk in his effort to earn maximum points. Then the same test is carried out under a load. Western experts emphasize that during this test only a specific variant of "risky behavior" is analyzed, and its result may be extrapolated to other situations only with regard for other data on the subject. Nonetheless its results are believed to be extremely useful, inasmuch as they can be used to predict behavior in extreme conditions, which is impossible to do with ordinary procedures (having the subject fill out test sheets, or studying his responses to questions from a psychologist).

Foreign military specialists feel that it is very important for pilots to have the capacity for maintaining a high

level of attention over a long period of time—that is, in a sort of "suspended" state. They feel that such a quality may be developed within oneself (within certain limits) through purposeful training, and as with susceptibility to tiring, the initial characteristics of this capability may be determined by means of the following test: The subject is required to record weak, irregular signals (optical, acoustic and others) over a long period of time in a monotonous situation poor in stimuli.

The subject's own analysis of the way he feels occupies a special place in the new Austrian pilot candidate selection system. The subject makes this analysis using a scale provided to him. This experiment is carried out twice—before and after testing. The interval between experiments is 9-10 hours as a rule. Comparing the subjective assessments of the subject with information from objective medical examination, specialists are able to establish how critical the self-assessments are.

Using the testing and diagnostic system created in Austria, psychologists receive hundreds of indicators and computer-calculated averages, ratios and approximations. However, Austrian specialists feel that these data are hardly enough to permit a conclusion as to the suitability or unsuitability of a candidate. They are cognizant of the fact that many of the things which a psychologist would like to know about a subject are beyond the grasp of even the most sophisticated machine. However, it is felt that the new procedure (when combined with traditional testing and mandatory personal interviews between the psychologist and subject) provides the specialist with an abundance of raw data that significantly increase the accuracy of his predictions. It is noted in the Western press that the experience of the Austrian specialists is being studied very carefully in many NATO countries.

**Footnote**

1. Ergometry—set of methods and procedures using special instruments (ergometers) to measure physical work done by an individual.—Editor.



## NATO's Efforts to Create the Military Transport Airplane of the Future

*18010215g Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 39-41*

[Article by Col N. Nikolayev]

[Text] Besides developing airborne resources for combat per se, NATO is also presently developing support resources, among which foreign military specialists include tactical military transport aircraft. Thus England's British Aerospace, France's Aerospatiale and West Germany's Messerschmitt-Bolkow-Blohm signed an agreement for joint creation of the FIMA (Future International Military Airlifter). In accordance with this agreement, a working group consisting of representatives from each company was formed in order to analyze the airplane's creation, the markets, financing and management of the development programs.

In particular the need for designing the FIMA-A, which would be capable of conveying cargo, weapons and military equipment, including self- propelled guns, and the FIMA-B, which would be somewhat smaller and similar to the C-130 Hercules, has already been determined.

It is believed that the FIMA-A should have four engines, and that it should be able to use paved landing strips 900 m long located in rear areas. The airplane's cargo cabin will have a cross section of 3.6x3.6 m, and it will be capable of accommodating cargo weighing up to 29,500 kg.

In early 1985 the partners to the FIMA development agreement refined its conception, reducing it to a single basic design of a military transport aircraft with a takeoff weight of 87,000 kg and a propulsion unit consisting of turboprop engines yet to be designed. The possibility for creating other types of airplanes with different dimensions on the basis of the requirements of the air forces of the countries participating in the project was allowed for in the design as well. For example the West German air force is experiencing a need for an airplane which could replace the C-160 Transall (also in the French air force, see color insert [not reproduced]) after the year 2000. The airplane must have four vintoventilyatornyye [transliteration: prop-fan?] engines, a takeoff weight of 80,000-85,000 kg, a 3.6x3.46x15 m cargo cabin and a range (with a load of 20,000 kg) of about 2,000 km. The U.S. Air Force is also interested in acquiring a sizable quantity of FIMA military transport aircraft capable of landing on an unprepared landing strip less than 450 m long to unload assault forces or perform other special tasks.

The total demand for FIMA aircraft is estimated at 750-1,000. Deliveries of the first airplanes are planned in 1999, which requires that flight tests of experimental models begin not later than 1997. However, Western specialists feel that were the requirements on this airplane to be developed and announced sooner, its creation could be accelerated.

Judging from reports in the foreign press, the United States is not yet taking a direct part in the FIMA project, though a number of American companies are conducting research on tactical military transport aircraft of the future; while this research is oriented on the possible needs of the U.S. Air Force, it may also be useful in the project of the European countries, in the event that the USA joins it.

In the opinion of American military experts improved short takeoff and landing characteristics, high reliability

and minimum demands in technical maintenance and logistical support are typical of the tactical military transport aircraft of the future. It must possess reduced vulnerability and heightened survivability. Thus an airplane capable of vertical or short takeoff and landing is what is required for airlifts within a theater of military operations and for dropping or landing troops in the enemy rear.

In February 1986 Lockheed, Boeing and McDonnell-Douglas were given orders to study future airlift resources. The companies had to find, among the numerous conceptions under investigation, a compromise which would result in a program of development of a tactical future military transport aircraft.

The following variants of the airplane were evaluated in the first stage of the research:

—a short takeoff and landing airplane with a takeoff and landing distance of 450 m prior to an obstacle 15 m high;

—an ultrashort takeoff and landing airplane with a takeoff and landing distance of 90-150 m prior to an obstacle 15 m high;

—a vertical or short takeoff and landing airplane with a takeoff distance of 0-90 m.

Various principles of utilizing propulsion units to create a lifting force in vertical or short takeoff and landing were also examined, including forcing air over the upper surface of the wings and using lifting and lifting-sustaining engines and rocket boosters. The number of variants of airplanes was reduced together with the number of variants of propulsion units to a minimum, after which different parameters were to be analyzed, to include characteristics, the cost of the life cycle, survivability and the influence of various technical concepts. All conceptions concerned with creating the tactical military transport airplane were based on the C-130's cargo cabin (for the C-130H-30: cabin length 16.79 m, maximum width 3.3 m, maximum height 2.81 m), but with a cargo weight of 29,500 kg. The research in support of the first stage was completed in mid-1987.

Other conceptions and requirements on the future military transport airplane were to be analyzed in the second stage of the research, with special attention being devoted to survivability. One of the objectives of survivability research was to reduce the effective scattering area by employing composite and radiosorbent materials.

Lockheed is checking out the technical concepts of the future tactical military transport airplane in an experimental airplane—the HTTB (High Technology Testbed) flying laboratory. It is a commercial L-100-20 modified and refitted for flight testing.

Initially the HTTB will be modified by mounting a large ridge above the fuselage before the vertical stabilizer and extensions along the sides of the fuselage in front of the horizontal tail to straighten the flow around the tail assembly and raise the effectiveness of control at low speed. The airplane was also equipped with an electron-optic piloting and navigation indicator with a heads-up display. The HTTB was equipped with a LADS (Lockheed Airborne Data System) system with 1,024 data transmission channels in order to permit rapid measurement, collection, analysis, transmission and display of experimental data. In addition the airplane's cargo cabin was set up to accommodate a special van—a mobile center for collecting and processing information from television and telemetric apparatus. During tests, this center is unloaded from the airplane in remote regions and used for data transmission and processing on the ground.

In 1987 further modifications were made on the HTTB: Equipment to be used in testing out various technical concepts associated with supporting tactical assault landing operations was installed. The work was to be completed in spring 1987. In particular a triply redundant digital electric remote flight control system designed with computer control and with digital data transmission (in place of a conventional mechanical control system employing hydraulic actuators), NAVSTAR satellite navigation apparatus, and a radio altimeter operating in the 2-cm band were installed in the airplane. The symbol system of the electron-optic indicator is being modified to display data necessary to support a short landing approach.

In order to test short takeoff and landing characteristics, deflected wingtips are installed on the wings to increase their curvature, and fast-acting two-slot flaps, spoilers, a rudder and ailerons with an enlarged chord are installed. Lockheed opted for a fixed deflection of the wingtips along the entire span, which ensures a high maximum lifting factor during a low-speed landing approach. In addition deflected wingtips reduce drag at cruising speed. The standard flaps of a C-130, which deflect 36°, are substituted by two-slot flaps with 29 percent greater area, and the rear panel of the flaps is designed to deflect an additional 30° (for a total flap deflection of 66°), which ensures a high lifting force and greater drag in a steep landing approach. The three-section spoilers on each wing panel will be used to control roll and trajectory, and to reduce lifting force during the landing run.

The controls of the HTTB will be powered by three independent high-pressure hydraulic systems (570 $kg/cm^2$, as compared to 210 $kg/cm^2$ on existing airplanes). CTFE (chlorotrifluoroethylene) noncombustible hydraulic fluid used in the airplane is 2.5 times heavier than standard hydraulic fluid, but the pipelines will be smaller (6.4 mm diameter for titanium pressure pipes and 9.6 mm for stainless steel return pipes), and there will be a smaller total amount of hydraulic fluid in the systems.

The airplane is equipped with strengthened landing gear with a greater energy absorption capacity. It is designed to absorb the kinetic energy of an airplane landing at a speed of up to 4.5 m/sec with a landing weight of 59,000 kg, and after reinforcement of the wing structure, it should support movement of an airplane over a bumpy dirt landing strip. The piston stroke of the shock-absorbing struts on the main braces of the landing gear was increased from 26.6 to 61 cm. Hydraulic drives powered by the hydraulic system are used to reduce the length of the shock-absorbing struts prior to raising the landing gear. Such landing gear makes it possible to land the airplane without having to level it prior to touchdown.

A standard C-130 Hercules carrying a load of 13,600 kg can land from a height of 15 m on a 750 m long landing strip on a glide path with an angle of 3°. The normal landing approach speed is 210-230 km/hr. The modified HTTB will land on a glide path with an angle of 6-8° at a speed of 145 km/hr without leveling off, which will mean a landing distance of about 450 m (from a height of 15 m).

Future modifications of the HTTB foresee installing a navigator- controlled turret with a laser range finder and an infrared viewing station or some other terrain mapping sensor. A fixed forward-looking infrared station transmitting an image to the pilot's electron-optic indicator is to be installed on the upper part of the fuselage. The main function of the infrared viewing station and laser range finder is to assist the pilot in making a short landing. During the landing approach the laser range finder is turned on to measure the range to the landing point. This range and other flight data, including acceleration measured by an inertial system, are fed into the aircraft computer, which calculates the flight trajectory and transmits the appropriate symbols to the electron-optic indicator. To guide the airplane to the landing point, the pilot simply keeps the large and small spots on the indicator superposed. A device to prevent stalling and an angle of attack indicator need to be installed aboard the airplane as well. It is anticipated that the scatter of the landing point will be reduced to 0.9 m in the transverse direction and to 3 m in the longitudinal direction. Such a self-contained guidance system will make it possible to land without the use of ground support resources. It will also provide the pilot the reference points he needs to land on an undamaged portion of a landing strip some distance from its axis, or on an unprepared strip.

The U.S. Air Force signed a contract with Lockheed to demonstrate this landing system: Tests on it are to be conducted in 1987.

Flight tests on the modified HTTB were initiated in the second half of 1987. There were plans to halt these tests in early 1988 in order to equip it with larger T56-A-101 turboprop engines (with an effective shaft power of 5,250 horsepower) in order that the airplane could attain a height of 15 m after a take-off distance of 450 m. The HTTB will be demonstrated at the 1988 Farnborough Air Show (Great Britain). By this time the project requirements on the FIMA airplane should be conclusively determined, such that the developing partners will have an opportunity to submit their proposals for satisfying these requirements. The role of the experimental HTTB is to test out the conceptions, systems and technical concepts that may be used in particular in the FIMA military transport aircraft.



## Radar Identification Systems

*18010215h Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 41-43*

[Article by Col R. Kazantsev]

[Text] NATO is continuing to make improvements on radar identification systems intended to determine membership of aircraft to one's own or other air forces. These systems have been created abroad since the 1940s, with the United States taking the lead in their development then and now. The Mk2, 3, 5 and 10 systems were successively designed and used in the 1940s-1950s. After that, the Mk10 was modernized with the purpose of improving its technical specifications, and its improved variant is still in the inventory of the air forces of the bloc's countries. But it does have one significant shortcoming—its low resistance to imitation (when necessary, the enemy can imitate the transponder signals).

The USA has been using the Mk12 radar identification system since the mid-1950s. This is a unified radioengineering complex including onboard (airplane or helicopter) and ground radar interrogators and transponders. Judging from reports in the foreign press, the main thing that makes the Mk12 system different from the Mk10 is presence of an additional mode which prevents enemy aircraft from imitating transponder signals. This mode requires the use of computerized cryptographic decoders by the airplanes (helicopters). A mechanical key periodically introduced into the device can be used to change the transponder code. Nonetheless the Mk12 has not become widespread in NATO countries. This is explained by the fact that as with the Mk10, it has the following shortcomings: It allows the enemy to track the aircraft by interrogating the transponders and then determining the bearing to them; the possibilities for working in the presence of a high density of ground interrogators are limited; identification range is short at low altitude, and interruptions in reception of interrogation signals occur owing to the shielding effects of aircraft structures as the airplane performs various maneuvers; it is relatively easy for the enemy to create deliberate (intentional) interference using radar suppression equipment, since the system uses two widely known fixed frequencies. Western military specialists note that the fight against mutually nonsynchronous interference

in the European theater of war, which is typified by a large quantity of airplane and ground transponders, is an especially acute problem. The shortcomings of radar identification systems listed above are to be corrected by improving existing identification systems or creating a fundamentally new one.

Developing a new aircraft and ground identification apparatus based on modern technology, equipping mobile and portable surface-to-air missile and artillery systems with identification resources and increasing the types of airplanes aboard which IFF transponders must be installed are among the principal directions of improving the Mk10 and 12 systems. Aircraft identification radar systems distinguished by small size and weight and possessing high reliability have already been created in recent years (the characteristics of some models of such apparatus are given in the table). Identification apparatus is also being developed for mobile and portable surface-to-air missile systems previously not equipped with Mk10 transponder systems. Thus England's Kossor [transliteration] designed series IFF880 and 890 apparatus for surface- to-air missile systems, and France's Tomson-KSF [transliteration] have initiated series production of Siklamen [transliteration], NRAI-6A, SB-14A and NRSI-3 apparatus.

**Basic Characteristics of Some Models of the Aircraft Apparatus of the Mk10 Radar Identification System**

| Apparatus Designation, Developing Country | Receiver Sensitivity, dB/mW | Transmitter Output Power, kW | Mean Time Between Failures, Hours | Weight, kg | Overall Dimensions, cm |
|---|---|---|---|---|---|
| | | | Transponders | | |
| AN/APX-101, USA | -77 | 0.1-0.5 | 800 | 7.7 | · |
| IFF2720, Great Britain | -76 | 0.5 | · | 4.6 | 9x19.4x31.4 |
| IFF3100, Great Britain | “ | 0.5 | · | 5.3 | 14.6x13.2x16.5 |
| AR15983, Great Britain | ” | 0.15 | · | 2.7 | 16x21.7x8.2 |
| NRAI-7A, France | -77 | 0.5 | · | 3.4 | 13x12.7x14.5 |
| NRAI-9A, France | -77 | 0.5 | · | 4.2 | 13x12.7x8 |
| ESD3300, France | -76 | 0.5 | · | 4 | 13.3x14.6x14.5 |
| ESD3400, France | -76 | 0.5 | · | 7.8 | 19.4x9x31.9 |
| | | | Interrogators | | |
| AN/APX-104, USA | -83 | 1.2 | 1,000 | 9 | “ |
| IFF3500, Great Britain | -80.5 | ” | · | 20.7 | “ |
| LSR-2000, FRG | -85 | 2 | 1,000 | 13 | ” |
| NRAI-11, France | -79 | 1 | · | 12 | 12.4x8x19.4 |
| NRAI-10A, France | -81 | 1 | · | 6.5 | 9.1x19.4x31.8 |

Note: The working frequency of the transmitter (of the transponders and interrogators) is 1,030 MHz, and that of the receiver is 1,090 MHz.

Agreement was reached between NATO countries in 1986 to jointly develop the NIS (NATO Identification System) radar identification system to be used by all countries of the bloc. It will be designed on the basis of the new American Mk15 radar identification system. It is to utilize the 10-and 3-cm wavebands, the structure of the signals is to be changed, transmitter power is to be increased to several hundred watts, and the principal shortcomings of the Mk10 and 12 systems are to be corrected chiefly by widely introducing the elements of computer technology and the latest accomplishments of electronics and cryptography.

Flight tests on an experimental model of the Mk15 system manufactured jointly by the USA's Raytheon and Bendix were started aboard an F-18 Hornet fighter in 1987. This apparatus has an interrogation signal frequency of 1,030 MHz, and the transponder receives a signal at 1,090 MHz. Transmitters using 10- and 3-cm bands interchangeable with similar apparatus of the Mk10 and 12 systems in relation to size and weight characteristics will be employed in the future. Besides the receiver- transponder unit, the experimental model contains an additional aircraft radar signal power amplifying unit, a display and control unit and a single antenna system. The final selection of the manufacturing company for full scale development of the equipment of the Mk15 system was to be made in mid-1988.

In 1988 the USA's Allied Signal and Raytheon and England's Kossor signed an agreement for joint development of the NIS system, which is the first practical step toward implementing the decision to create an all-NATO identification system. The NISPO (NATO Identification System Project Office) created under the NATO joint forces headquarters is responsible for coordinating development of the unified radar identification system.

Nonetheless foreign experts note that Mk15 and NIS apparatus will not independently ensure unambiguous and certain identification without other information sources. In particular American specialists feel that besides the Mk15, a new combined system capable of

ensuring certain identification of friendly resources in peacetime and in combat must be developed on the basis of existing and future detection, control, identification and information transmission systems. In addition research is being conducted to create one other source of identifying data including a set of distinguishing target characteristics typical of a given form of target. Studying the possibility for using different ranges of the electromagnetic spectrum for identification of air-to-air systems is also believed to be necessary. A number of characteristics of the targets and their emission capabilities must be studied in this regard; the main attention is to be devoted to the radio, visible and infrared ranges.

Both American and European companies are presently continuing their work on these problems. It is anticipated that the NIS and Mk15 systems will be adopted not earlier than the mid-1990s.



## Improvement of the Airspace Observation System in NATO

*18010215i Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 45-46*

[Article by Cand Tech Sci, Col D. Figurovskiy]

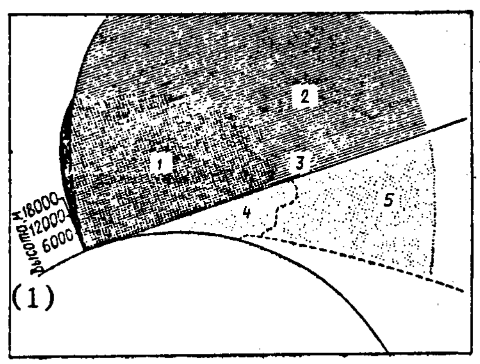
[Text] It is reported in the foreign press that NATO is working on plans to create a joint command and control system for the bloc's air forces and air defense resources—the ACCS (Air Command and Control System). Its zone of operations must cover the entire "region of responsibility" of NATO joint forces in Europe, and it must provide a possibility for organizing the use of air and air defense resources coordinated in place and in time in various combat missions.

Western specialists feel that the airspace observation system is one of the most important elements of the ACCS. This is why ways of improving existing airspace observation resources and creating new resources are being examined in the course of the discussion of these plans. They attempt to justify the need for such improvements by the supposedly greater capabilities of the armed forces of the probable adversary for fire damage and electronic suppression of existing radar stations. In addition the enemy may acquire hard-to-detect airplanes built utilizing advances in stealth technology. Problems will arise as a result in organizing dependable airspace surveillance.

One English military specialist believes that the principal direction of solving these problems is integrated use of air (AWACS aircraft—for example the E-3A) and ground detection equipment, including that which operates on the basis of new or rarely employed principles of operation. In his opinion over-the-horizon radar[1] could become the most effective and promising ground resource for observing the airspace over European theaters of military operations.

Western experts estimate that such a station operating in the shortwave band of the radio frequency spectrum would be capable of detecting targets flying at high altitude 1,300-3,000 km away and targets at low altitude up to 300 km away—that is, it would have significant range advantages over existing UHF radar. A diagram showing the detection zones of conventional and over-the-horizon radar in the vertical plane was presented in a certain foreign journal to illustrate this principle (see figure).

**Airborne Target Detection Zones (Vertical Plane) for Existing Conventional and Future Over-the-Horizon Radar: 1—zone of operation of existing radar operating in the UHF range; 2—zone of operation of over-the-horizon radar above the line of sight; 3—line of sight; 4—region of unreliable detection by existing radar; 5—zone of operation of over-the-horizon radar below the line of sight**




Key:
1. Altitude

Practically complete invulnerability to antiradar missiles and the difficulty of creating coatings for airplanes (in the operating range of radar frequencies) which would absorb radar signals and reduce the probability of their detection are felt to be other merits of over-the- horizon radar. The first advantage can be explained by the impossibility of developing, at the present stage of development of science and technology, guided missile homing heads intended to destroy over-the-horizon radar stations, inasmuch as the signal propagates due to reflection from the ionosphere, which excludes the possibility of directly determining the direction to the station transmitter. The second advantage is confirmed by the fact that absorptive coverings effective in the shortwave range are very thick and heavy, precluding their use on airplanes. As far as electronic suppression of over-the-horizon radar is concerned, NATO specialists feel that the enemy would run into the problem of creating fundamentally new, cumbersome and extremely expensive equipment.

In the opinion of Western experts, were such stations to be deployed in Europe, the combat capabilities of other airborne target detection resources would expand as well. In particular, over-the-horizon radar would permit prompt deployment of AWACS airplanes in the air in optimum zones for detecting targets and controlling active air defense resources. In addition a possibility will appear for deceiving the enemy more effectively in regard to the actions of one's own air defense system; this can be done by using commands generated on the basis of data from over-the-horizon radar tracking the actions of enemy air forces to switch ground radar stations and their simulators in a pattern coordinated in time and in space.

Judging from reports in the foreign press, no decisions have yet been made to create and deploy such stations in Europe, but work is proceeding along the lines of developing the existing airspace surveillance system: Existing ground resources and aircraft radar and other equipment for AWACS airplanes are being improved, and plans are being made to purchase new equipment with broader combat capabilities.

Some foreign specialists feel that because of financial difficulties, over-the-horizon radar will be created in stages. In addition, some specialists are insistently urging an increase in the pace of this work.

NATO's plans to deploy over-the-horizon radar in Europe are clearly aggressive, inasmuch as even the foreign press emphasizes that such radar has great possibilities for observing the airspace of socialist countries to considerable depth, and such radar is protected against fire effects to a greater extent than any other airborne target detection equipment, including that deployed in space.

**Footnote**

1. For greater detail on the principles of operation and characteristics of stations, see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 5, 1987, pp 38-44.—Editor.



## Japanese Naval Aviation

*18010215j Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 47-52*

[Article by Capt 1st Rank R. Fedorovich]

[Text] Naval aviation is a branch of the Japanese Navy. Its rebirth in postwar Japan began with the creation of the "naval police corps," at which time the first air formations were formed—the Tateyama (16 September 1953) and Kanoya (1 December 1953) separate air groups, and it went on to the 1960s. The naval air command and the naval training air command were formed in August 1961. By this time 230 airplanes and helicopters had been delivered to the Japanese navy under the guise of "assistance" from the USA (16 P-2V7, 60 S-2F1, 20 TBM-3S/W, 16 PV-2, 52 SNJ, 35 SNB-3, 2 PBY-6A, 4 JRF-5, 4 R4D-6/6Q, 2 T-34, 3 S- 51, 7 Bell-47G, 3 S-55 and 2 S-58). In addition production of naval airplanes and helicopters was started in Japanese enterprises, chiefly under American license, in 1958. Thus far allocations have been made in behalf of Japanese naval aviation for the acquisition of 838 airplanes and helicopters of different types, to include over 70 (28 P-3C, 1 EP- 3J, 1 U-36A, 28 HSS-2B, 6 MH-53E, 1 LC-90, 3 KM-2K, 1 US-1A and 2 OH-6D) still in different stages of production, to be delivered to air units through fiscal year 1990 inclusively (Table 1). The plan for naval development in fiscal year 1988 (which began 1 April) foresees initial allocations for the construction of another 15 airplanes (nine P-3C, one EP-3J, one US-1A, one U-36A, three KM-2K) and 12 SH-60J deck-landing helicopters. Naval aviation is divided in relation to purpose into combat and auxiliary aviation. Air units of the Japanese navy possess 175 warplanes and helicopters and 100 auxiliary craft (see color insert [not reproduced]). The total number of personnel in the air units exceeds 11,000 (around 25 percent of the navy's strength).

Shore-based patrol aviation is the backbone of Japanese naval combat aviation. It is intended for reconnaissance, search, detection and destruction of enemy submarines and surface ships (vessels) up to 1,000 nautical miles from the Japanese coast using antisubmarine torpedoes, depth charges, unguided aircraft rockets and antiship missiles. Submarines and surface ships are hunted chiefly with aircraft radar stations, magnetic detectors, gas analyzers and radio-sonobuoys. Western military specialists feel that in terms of its strength and capabilities, Japanese shore-based patrol aviation is inferior only to the U.S. Navy in the capitalist world.

Japanese naval combat aviation is represented organizationally by the naval air command and separate air squadrons of antisubmarine helicopters assigned to specific naval regions, while auxiliary aviation is represented by the training air command. The stations of air formations and units are shown in Figure 1. The **fleet air command** (Figure 2) is headed by a commander (officially a vice admiral's position) to whom a headquarters, seven air wings (1st, 2d, 4th, 5th, 21st, 22d and 31st), three separate air squadrons (51st, 61st, 111th), a shore-based aviation air traffic control detachment (Atsugi), an airfield engineer support detachment (Hachinohe) and service subunits are subordinated. The personnel strength of fleet aviation is around 85,000 (over 30 percent of the navy's personnel). Naval aviation headquarters (Atsugi Air Base), which is headed by the chief of staff (officially a rear admiral's position), is divided into sections and departments. A command post, a communication center and an operational antisubmarine warfare center (the Central ASWOC—Antisubmarine Warfare Operation Center), which coordinates closely with a computer complex (the GSCC—Ground Support Computer Complex), which is a branch of the naval computer center, and with the antisubmarine posts

## Table 1. Japanese Navy's Aircraft Pool and Aircraft Construction Programs

| Наименование и типы авиационной техники ВМС (год принятия на вооружение) (1) | Заказано всего в 1953—1987 годах (2) | (3) Имеется в настоящее время: в авиационных частях (4) | в постройке (5) | Планируется заказать до 1991 года (6) | Намечено иметь в авиационных частях в 90-х годах (7) |
|---|---|---|---|---|---|
| **Боевая авиация(8)** | | | | | |
| Боевые самолеты (9) | 323 | 95 | 30 | 36 | 109 |
| базовые патрульные:(10) | 319 | 89 | 28 | 31 | 100 |
| P-3C (1981) | 69 | 41 | 28 | 31[3] | 94[3] |
| P-2J (1969) | 83 | 45 | — | — | 6 |
| PS-1 (1971) | 23 | 3 | — | — | — |
| прочие (11) | 144 | — | — | — | — |
| разведчики и РЭБ:(12) | 4 | 6 | 2 | 5 | 9 |
| EP-3J (1990) | 1 | — | 1 | 2 | 3 |
| U-36A (1987) | 3 | 2 | 1 | 3 | 6 |
| UP-2J/2JE (1980) | (5)[1] | 4 | — | — | — |
| прочие (11) | (6)[1] | — | — | — | — |
| Боевые вертолеты (13) | 204 | 80 | 34 | 42 | 114 |
| противолодочные: (14) | 189 | 75 | 28 | 36 | 102 |
| SH-60J (1989) | 2[2] | 2 | — | 36 | 36 |
| в том числе палубные(15) | 2[2] | 2 | — | 36 | 36 |
| HSS-2B (1980) | 84 | 54 | 28 | — | 66 |
| в том числе палубные(15) | 49 | 33 | 14 | — | 12 |
| HSS-2A (1975) | 28 | 19 | — | — | — |
| прочие (11) | 75 | — | — | — | — |
| тральщики: (16) | 15 | 5 | 6 | 6 | 12 |
| MH-53E (1989) | 6 | — | 6 | 6 | 12 |
| V-107A (1967) | 9 | 5 | — | — | — |
| **Вспомогательная авиация(17)** | | | | | |
| Вспомогательные самолеты(18) | 247 | 75 | 5 | 21 | 75 |
| поисково-спасательные: (19) | 22 | 7 | 1 | 2 | 7 |
| US-1A (1975) | 11 | 7 | 1 | 2 | 7 |
| прочие (11) | 11 | — | — | — | — |
| учебные и связи: (20) | 211 | 58 | 4 | 19 | 58 |
| KM-2K (1989) | 3 | — | 3 | 12 | 15 |
| KM-2 (1963) | 54 | 32 | — | — | 17 |
| LC-90 (1988) | 1 | — | 1 | 7 | 8 |
| TC-90 (1974) | 22 | 21 | — | — | 17 |
| UC-90 (1982) | 1 | 1 | — | — | 1 |
| B-65 (1963) | 28 | 4 | — | — | — |
| прочие (11) | 102 | — | — | — | — |
| транспортные:(21) | 14 | 10 | — | — | 10 |
| YS-11MA (1966) | 4 | 4 | — | — | 4 |
| YS-11TA (1969) | 6 | 6 | — | — | 6 |
| прочие(11) | 4 | — | — | — | — |
| Вспомогательные вертолеты (22) | 64 | 25 | 2 | 5 | 25 |
| поисково-спасательные: (19) | 36 | 16 | — | 3 | 15 |
| HH-X или -60J (1991) (23) | — | — | — | 3 | 3 |
| S-61A (1965) | 17 | 16 | — | — | 12 |
| прочие (11) | 19 | — | — | — | — |
| учебные: (24) | 28 | 9 | 2 | 2 | 10 |
| OH-6D (1983) | 7 | 4 | 2 | 2 | 8 |
| OH-6J (1972) | 3 | 3 | — | — | 2 |
| Белл-47G (1953) (25) | 15 | 2 | — | — | — |
| прочие(11) | 3 | — | — | — | — |

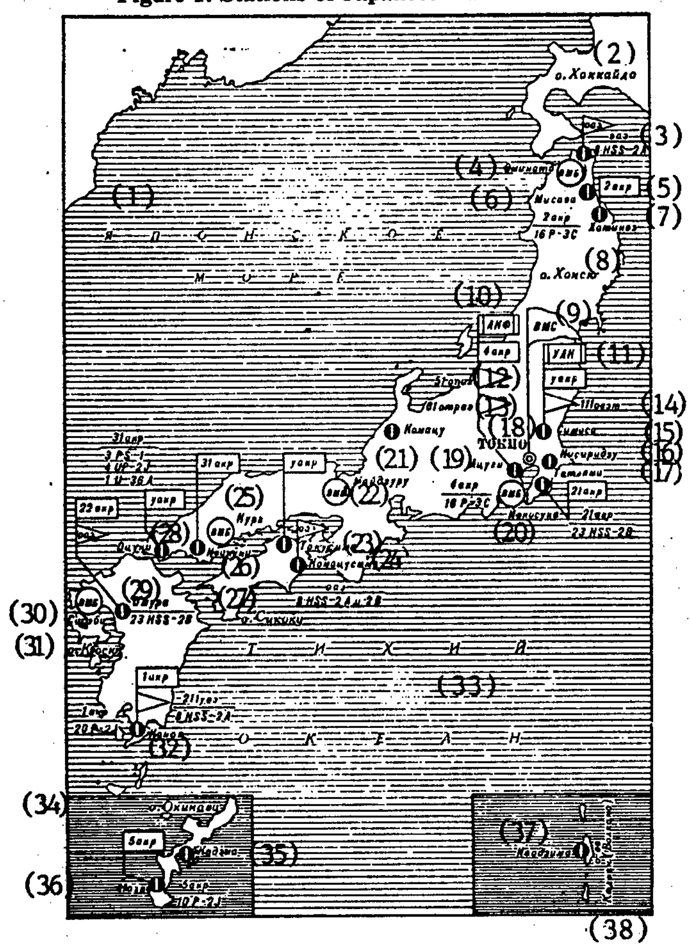
[1] Переоборудованы из самолетов P-2J и других. (26)

[2] Опытные вертолеты XSH-60J.(27)

[3] Самолеты P-3C модификации Update-III. (28)

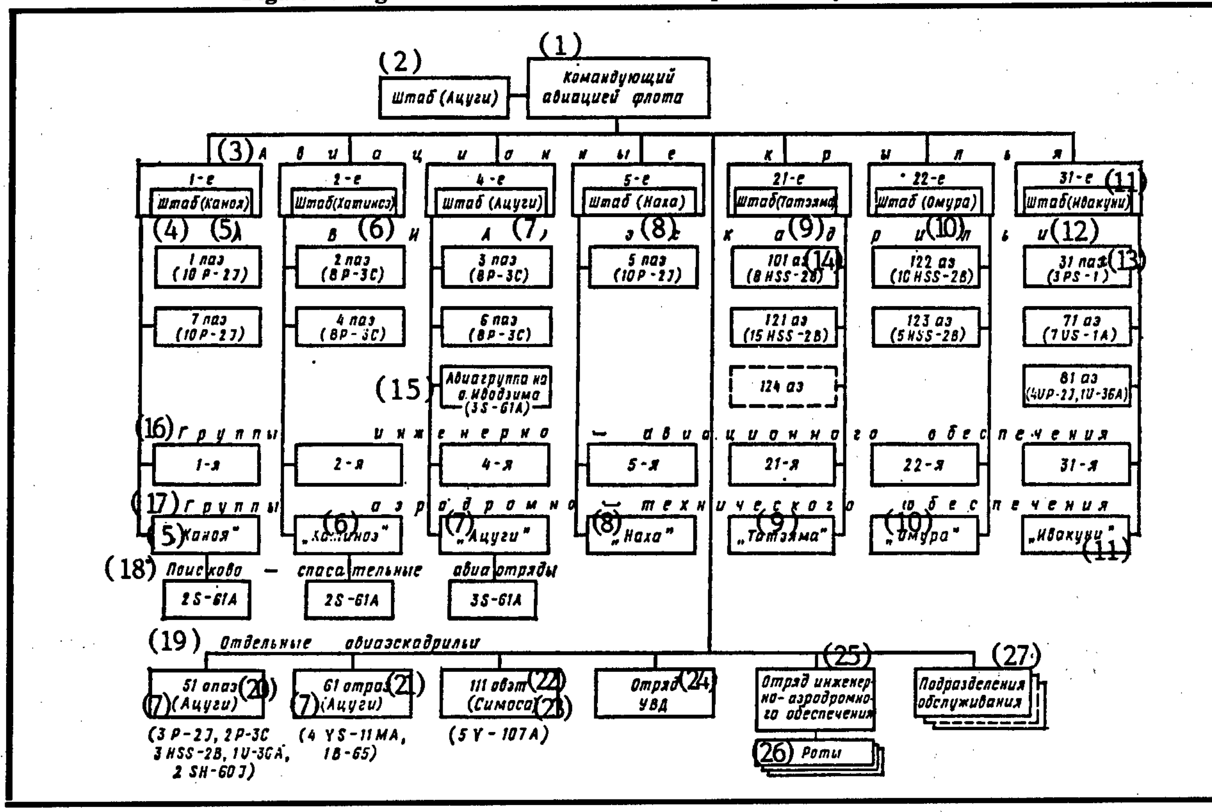
Key:
1. Name and type of naval aviation equipment (year of adoption
2. Total ordered in 1953-1987
3. Presently available
4. In air units
5. Under construction
6. Orders planned to 1991
7. To be possessed by air units in the 1990s
8. Combat aviation
9. Warplanes
10. Shore-based patrol
11. Other
12. Reconnaissance and electronic warfare
13. Helicopter gunships
14. Antisubmarine
15. Including deck-landing
16. Minesweepers
17. Auxiliary aviation
18. Auxiliary airplanes
19. Search and rescue
20. Training and liaison
21. Transport
22. Auxiliary helicopters
23. Or
24. Training
25. Bell
26. 1. Refitted out of P-2J and other airplanes
27. 2. Experimental XSH-60J helicopters
28. 3. P-3C airplanes with the Update-III modification

**Figure 1. Stations of Japanese Naval Aviation**




Key:
1. Sea of Japan
2. Hokkaido
3. Separate air squadron
4. Ominato
5. Air wing
6. Misawa
7. Hachinohe
8. Honshu
9. Naval station
10. Fleet air command
11. Training air command
12. Separate patrol air squadron
13. Separate airlift squadron
14. Separate minesweeping helicopter squadron
15. Shimosa
16. Kisarazu
17. Tateyama
18. Tokyo
19. Atsugi
20. Yokosuka
21. Maizuru
22. Naval base
23. Tokushima
24. Komatsushima
25. Kure
26. Iwakumi
27. Shikoku
28. Ozuki
29. Omura
30. Sasebo
31. Kyushu
32. Kanoya
33. Pacific Ocean
34. Okinawa
35. Kadena
36. Naha
37. Iwo Jima
38. Kazan (Volcano)

**Figure 2. Organizational Structure of the Japanese Navy's Air Command**




Key: 1. Commander, fleet aviation
2. Headquarters (Atsugi)
3. Air wings
4. Headquarters
5. Kanoya
6. Hachinohe
7. Atsugi
8. Naha
9. Tateyama
10. Omura
11. Iwakumi
12. Air squadrons
13. Shore-based patrol air squadron
14. Air squadron
15. Iwo Jima air group
16. Airfield engineer support groups
17. Airfield technical support groups
18. Search and rescue air detachments
19. Separate air squadrons
20. Separate shore-based patrol air squadron
21. Separate airlift air squadron
22. Separate minesweeping helicopter squadron
23. Shimosa
24. Air traffic control detachment
25. Airfield engineer support detachment
26. Companies
27. Service subunits

(ASWOC) of the patrol air wing headquarters, are also subordinated to the chief of staff. The computer complex includes a computer center (the PGC—Program Generation Center) and various information input and display devices (the SDF—Software Development Facility). When it comes to problems concerned with classifying detected targets, the Antisubmarine Warfare Operation Center coordinates its activities closely with the sonar center (the AAC—Acoustic Analysis Center), which is also located at Atsugi Air Base and which is a part of the navy's central organization.

An air wing is the basic tactical unit of naval aviation. A headquarters and service subunits, up to three air squadrons, one airfield engineer support group and one airfield technical support group are subordinated to the commander of each air wing (officially a rear admiral's position). In addition a wing may include a separate air group. The personnel strength of an air wing is from 600 to 1,500 depending on the subunits it contains. The official rank of a wing chief of staff and of the commanders of air squadrons and support groups is captain 1st rank (captain).

Air squadrons contain a flight crew air detachment (made up of up to three air flights) and technical personnel (aviation technician) detachments. The personnel are formed into crews (up to one and a half crews per airplane). For example an air squadron officially possessing nine P-3Cs has a strength of around 250 persons, including up to 150 aircrew (including over 60 officers).

The airfield engineer support groups of the air wings implement the following measures directed at maintaining aviation equipment and armament constantly ready

for combat missions: organizing proper operation of aviation equipment, increasing its viability and flight safety, promptly carrying out repairs, supporting movements of air units, and teaching aircrews, engineers and technicians how to service and repair aviation equipment. Airfield engineer support groups are numbered as the corresponding combat air wings, and they organizationally include several detachments providing different forms of airfield engineer support.

The airfield technical support groups of the air wings carry out measures within the framework of a given form of rear flight support. These measures include preparing the airfield, airfield structures and ground equipment for flying, providing logistical support to preparation of aviation equipment for flying, evacuating airplanes (helicopters) suffering mishap or making a forced landing, and organizing the search and rescue service. The airfield technical support groups do not possess their own numbers; instead, they are distinguished by the names of the airfields at which the corresponding air wings are stationed. Some of them contain search and rescue air detachments (with two or three S-61A helicopters in each). Auxiliary vessels and boats are usually assigned to the airfield technical support groups of the air wings from the inventory of the naval regions.

Service subunits subordinated to the air wing headquarters support operation of the command post, the communication center and the antisubmarine warfare post (ASWOC) under the command post of the corresponding air wing, and protect its facilities.

The 2d and 4th patrol air wings each contain two air squadrons (correspondingly the 2d and 4th and the 3d and 6th patrol air squadrons), and airfield engineer support and airfield technical support groups, located at Hachinohe and Atsugi air bases. Each of these air squadrons contains eight P-3C (Update-II) patrol aircraft. In addition the 4th Air Wing includes a separate air group at Iwo Jima. It concerns itself chiefly with airfield engineer and airfield technical support to patrol airplanes flying periodically to this island. The 5th Air Wing has one patrol air squadron (the 5th), and the 1st Air Wing has the 1st and 7th patrol air squadrons (up to 10 P-2J airplanes in each), and the corresponding airfield engineer support and airfield technical support groups at Naha and Kanoya air bases. The 31st Air Wing (Iwakumi Air Base) contains three air squadrons: the 31st Air Squadron (three obsolete PS-1s), the 71st Air Squadron (seven US-1A search and rescue seaplanes) and the 81st Air Squadron (electronic warfare and combat training support airplanes—two UP-2J, two UP-2JE and one U-36A), as well as the 31st Airfield Engineer Support Group and the Iwakum Airfield Technical Support Group. The 21st and 22d air wings contain two helicopter air squadrons each, each possessing 5-15 HSS-2B shore- and carrier-based ASW helicopters, and the corresponding airfield engineer and airfield technical support groups at Tateyama and Omura air bases. Carrier helicopters of the 121st Air Squadron, 21st Air Wing are assigned to ships of the 1st and 4th destroyer flotillas, those of the 122d Air Squadron, 22d Air Wing are assigned to ships of the 2d Destroyer Flotilla, and helicopters of the 123d Air Squadron, 22d Air Wing are assigned to ships of the 3d Destroyer Flotilla of the Japanese navy's escort forces command. Formation of the 124th Air Squadron, 21st Air Wing is to be completed in fiscal year 1988 (with introduction of new class "Asagiri" ships into the composition of the 46th Battalion, 1st Destroyer Flotilla, and with transfer of the 43d Battalion to the commander of the 4th Destroyer Flotilla); in this case the 101st Air Squadron (eight shore-based HSS-2B helicopters) is to be transferred in the future to the commandant of the Yokosuka naval region.

Separate air squadrons include a headquarters, up to two air detachments (each containing two or three air flights) and airfield engineer support detachments. The airfield engineer support detachments are numbered as the separate air squadrons.

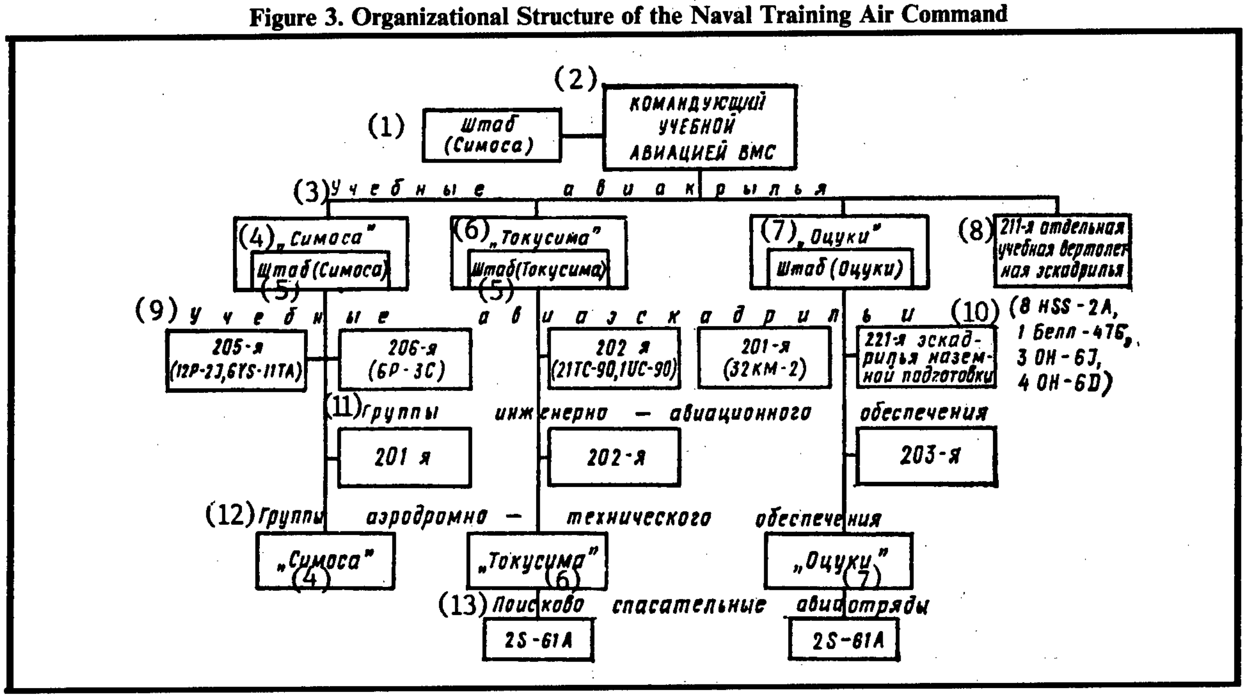
The 51st Separate Patrol (Test) Air Squadron is intended to test new aviation equipment and to study the procedures of combat use of existing models of airplanes and helicopters. It possesses 11 aircraft (three P-2J, two P-3C, three HSS-2B, one U-36A, two SH-60J), and it is based at Atsugi Air Base; the 61st Separate Airlift Squadron (four YS-11MA, one B-65) is also located at Atsugi. The 111th Separate Minesweeping Helicopter Squadron (five V-107A) is based at Simosa Air Base.

**Air formations of the naval regions.** The Kure, Sasebo and Ominato naval regions each possess one separate shore-based ASW helicopter air squadron (up to eight HSS-2A and -2B in each) correspondingly at Komatsushima, Omura and Ominato airfields. A separate carrier helicopter detachment (two S-61A and one Bell-47G) assigned to the icebreaker "Sirase" is subordinated to the commandant of the Yokosuka naval region.

Separate air squadrons of the naval regions include a headquarters, an air detachment (two or three air flights) and airfield engineer and airfield technical support detachments (when based at airfields from which other air units are absent). Separate air squadrons of the naval regions and their detachments are not numbered; instead, they are distinguished by the name of their station.

The **naval training air command** (Figure 3) is headed by a commander (officially a vice admiral's position). A headquarters (Shimosa Air Base), three training air wings (the Shimosa, Tokushima and Ozuki training air wings) and the 211th Separate Training Helicopter Squadron at Kanoya Air Base are subordinated to it (the official ranks of the chief of staff of training aviation and of the training wing commanders are captain 1st rank and rear admiral). The organizational structure of training air wings is similar to the structure of combat air wings: They include a headquarters, one or two air squadrons, and airfield engineer and airfield technical

**Figure 3. Organizational Structure of the Naval Training Air Command**




Key: 1. Headquarters (Shimosa)
2. Commander, naval training aviation
3. Training air wings
4. Shimosa
5. Headquarters
6. Tokushima
7. Ozuki
8. 211th Separate Training Helicopter Squadron
9. Training air squadrons
10. 221st Ground Training Squadron
11. Airfield engineer support groups
12. Airfield technical support groups
13. Search and rescue air detachments

support groups. The official rank of the chiefs of staff of training air wings and of the commanders of training squadrons and support groups is captain 1st rank.

The Shimosa Training Air Wing contains two training air squadrons: the 205th (12 P-2J and six YS-11TA) and the 206th (six P-3C); the Tokushima and Ozuki training air wings each possess one air squadron—correspondingly the 202d (21 TC-90 and one UC-90) and the 201st (32 KM-2). These air wings correspondingly contain the 201st, 202d and 203d airfield engineer support groups and the Shimosa, Tokushima and Ozuki airfield technical support groups stationed at air bases of the same names. The last two airfield technical support groups contain search and rescue detachments (two S-61A helicopters in each). The Ozuki Training Air Wing also contains the 221st Ground Training Squadron (aviation equipment is absent) providing 16-month training courses for senior technical personnel.

The **airfield network** of naval aviation contains 12 permanent air bases. In addition shore-based patrol and ASW aviation sporadically employs another five airfields. The characteristics of the principal airfields used by Japanese naval aviation are given in Table 2.

(To be concluded)

**Table 2. Principal Airfields Used by Japanese Naval Aviation**

| (1) Наименование аэродрома | (2) Координаты центра ВПП | | Основная ВПП: длина x ширина, м (5) |
|---|---|---|---|
| | (3) с. ш. | (4) в. д. | |
| Ацуги • (6) | 35°27′ | 139°27′ | 2440 x 45 |
| Ивакуни • (7) | 34 08 | 132 14 | 2440 x 45 |
| Каноя • (8) | 31 22 | 130 50 | 2250 x 60 |
| Комацусима • (9) | 33 58 | 134 39 | 220 x 50 |
| Наха • (10) | 26 11 | 127 38 | 2730 x 45 |
| Оминато • (11) | 41 14 | 141 09 | 600 x 45 |
| Омура • (12) | 32 55 | 129 55 | 1200 x 30 |
| Оцуки • (13) | 34 02 | 131 03 | 1200 x 60 |
| Симоса • (14) | 35 47 | 140 00 | 2250 x 60 |
| Татэяма • (15) | 34 57 | 139 52 | 300 x 45 |
| Токусима • (16) | 34 08 | 134 35 | 2400 x 45 |
| Хатиноэ • (17) | 40 33 | 141 27 | 2250 x 60 |
| Иводзима (18) | 24 47 | 141 19 | 2650 x 60 |
| Кадэна (19) | 26 21 | 127 46 | 3700 x 90 |
| Кисарадзу (20) | 35 23 | 139 54 | 1830 x 60 |
| Комацу (21) | 36 23 | 136 24 | 2700 x 45 |
| Мисава (22) | 40 42 | 141 22 | 3050 x 45 |

(23) • Аэродромы постоянного базирования авиации ВМС.

Key:
1. Airfield
2. Coordinates of center of landing strip
3. North Lat
4. East Long
5. Main landing strip: length x width, m
6. Atsugi
7. Iwakumi
8. Kanoya
9. Komatsushima
10. Naha
11. Ominato
12. Omura
13. Ozuki
14. Shimosa
15. Tateyama
16. Tokushima
17. Hachinohe
18. Iwo Jima
19. Kadena
20. Kisarazu
21. Komatsu
22. Misawa
23. Airfields at which naval aviation is permanently stationed

## Communication Equipment of "Ticonderoga" Class Guided Missile Cruisers

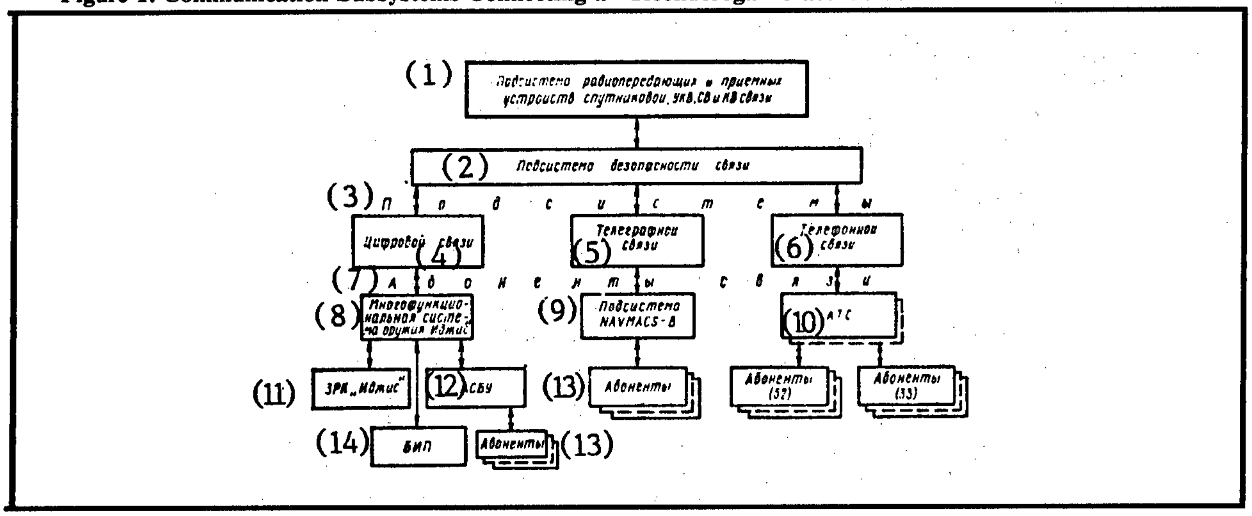
*18010215k Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 55-58*

[Article by Capt 1st Rank A. Markov]

[Text] "Ticonderoga" class guided missile cruisers[1] are multipurpose ships designed to fight enemy air, naval surface and submarine forces in actions within carrier and surface strike groups. To carry out these missions they are equipped with diverse communication resources ensuring timely, highly reliable, authentic and secure communication. These resources embody the principal accomplishments of science and technology, and especially electronics.

Communication equipment of "Ticonderoga" class guided missile cruisers operates in the ultrashort-wave, shortwave and medium-wave bands to support exchange of information in digital communication, telegraph, telephone and printing modes. Functionally they make up several subsystems (Figure 1). Communication equipment is controlled from a central communication post located in a radio room. The radio room and transmitting center, in which the principal communication apparatus is located, are situated on the second platform of the superstructure between the 200th and 260th transverse frames, and they occupy an area of about 130 $m^2$. Spare equipment and back-up apparatus is stored in a communications equipment storeroom in the aft part of the third deck. The radio communication equipment repair shops are located in compartments adjacent to the radio room and transmitting center. Automated ship systems are installed aboard "Ticonderoga" class guided

Figure 1. Communication Subsystems Connecting a "Ticonderoga" Class Guided Missile Cruiser to Parties




Key:
1. Satellite, ultrashort-wave, medium-wave and shortwave communication radio transmitting and receiving device subsystem
2. Communication security subsystem
3. Subsystems
4. Digital communication
5. Telegraph communication
6. Telephone communication
7. Communication parties
8. Aegis polyfunctional weapon system
9. NAVMACS-B subsystem
10. Automatic switchboard
11. Aegis surface-to-air missile system
12. Automated combat control system
13. Parties
14. Combat information post

missile cruisers. The polyfunctional Aegis weapon system, which includes a surface-to-air missile system of the same name, AN/SPY-1A radar and a computer, is the principal system of this kind. It interacts closely with the automated combat control system. Information is exchanged with other ships (parties) in digital form, for which purpose a LINK-11 communication line is employed.

The LINK-11 digital data transmission line operates in the shortwave and ultrashort-wave bands, which makes it possible to use it while cruising within an operational formation or group. Signals are transmitted in single-band telegraph mode via 16 channels at a rate of 2,400 bits/sec. The total signal is formed out of tonal frequency channel signals. The terminal devices of the LINK-11 line (Figure 2 [not reproduced]) control the flow of information transmitted in the NTDS system. Data are routed to the radio transmitter from the output of an AN/UYK-7 computer in the form of 24-bit blocks of information. The information to be transmitted is coded using an interference-resistant code, making it possible to detect and correct mistakes at the time of reception.

One of the ship radio stations controls exchange of information between ships. Setting the working cycle of LINK-11, it determines the sequence of transmitting messages between ships of a formation (group). Work begins when the synchronization and address signals of the first ship are transmitted from the control station. After transmission of information by the first ship is completed, the control station gives the address of the next ship. The complete operating cycle of the system ends with transmission of a special signal by the control station. The process of mutual data exchange in the NTDS system is fully automated, and it is carried out without the participation of operators. Information usually contains data on the locations of targets obtained from shipboard detection equipment (radar, sonar etc.). Data exchange using LINK-11 is also possible with E-2C Hawkeye AWACS airplanes, S-3A Viking carrier ASW aircraft and P-3C Orion shore-based patrol aircraft outfitted with the appropriate apparatus.

A LINK-14 data transmission line may be used to transmit information from cruisers to ships not equipped with the NTDS system. Data are transmitted by it at a rate of 75 bits/sec via conventional letter-printing channels in the shortwave and ultrashort-wave bands.

Digital communication has enjoyed the widest application in the following tactical communication networks of an operational formation (group): the general communication network servicing formations and formation and group commanders; the reconnaissance data transmission network; the ASW forces control network. These networks chiefly utilize the FLEETSATCOM satellite communication system. Specialized modules containing standard ship minicomputers have been developed for

each of them. The terminals of the satellite communication system are located in the command post, on the bridge, at the reconnaissance post and in the combat information post.

The transceiver subsystem supports operation in digital communication, telegraph, telephone and printing modes in the medium-wave, shortwave and ultrashort-wave bands, including via FLEETSATCOM channels. It includes over 70 different receiving and transmitting devices and radio stations, some of which operate by way of communication satellites. A cruiser employs satellite communication equipment primarily; it carries the maximum load. It provides for two-way communication with other facilities and reception of circular transmissions.

The AN/WSC-3 two-way communication station includes transceiving apparatus (Figure 3 [not reproduced]) and antenna feeders. Four RT- 1107/WSC-3 transceivers made by Electronic Communications are assembled on an OK-326/WSC-3 rack located in a separate unserviced compartment of the transmitting center. Wire communication lines from a NAVMACS-B subsystem, a telephone switchboard and a digital communication computer are secured to the rack. The transceiver (weight 64.4 kg, dimensions 31.1x57.2x48.1 cm, power supply 115 or 230 V, 60 Hz, emitted power 100 W) operates in the 225-400 mHz range at 7,000 fixed frequencies (with a frequency separation of 25 kHz); it is pretuned to 20 operating frequencies. The radio station supports two forms of communication: by way of a relay satellite, and conventional to within line of sight. It supports telephone and telegraph communication, as well as transmission of data in digital form in amplitude, frequency and phase modulation modes at rates from 75 to 9,600 bits/sec. By appropriately switching and replacing certain units, it can be used for wide-band and narrow- band transmissions. The station's modular design and its built-in monitoring apparatus make it possible to quickly find and eliminate faults by replacing modules, which takes not more than 10 minutes.

A rod aerial is used for reception and transmission at line of sight range, while satellite communication requires the use of two AS- 3018A/WSC-1 directional antennas possessing wide-band dipoles with flat 1.2 m diameter reflectors. The antenna feeders are installed together with filters and preamplifiers on brackets at the front and back parts of the superstructure. The antenna is maintained at a set bearing by a gyroscopic servo drive, and at a certain elevation by manual remote control.

A Motorola AN/SSR-1 receiver, which is located together with the demodulator in the radio room and which is connected by way of the control console of the NAVMACS-B subsystem to a printer, is used for reception of circular transmissions carried on by a one-way satellite communication channel. Only messages addressed to the given ship are printed out at a rate of 75 bits/sec. Messages are received by one or several of 15 channels set to fixed operating frequencies. The antenna feeders include four identical crossed dipole antennas (each with a total height of 90 cm), installed at the highest points on superstructures and on masts, which ensures reception of a signal from a satellite no matter what the course of the ship might be.

Besides satellite communication, conventional radio communication resources are widely employed in most communication networks linking a ship with external facilities (on shore, in the air or at sea). Two-way radio communication is carried on by means of radio stations in the ship's transmitting center. About 20 radio stations are installed in a cruiser, with up to 15 of them operating in the ultrashort-wave range. The AN/SRC-20A ultrashort-wave radio station, which is capable of telephone and telegraph communication in a formation's tactical radio networks, is typical. The station, which is 140x56x69 cm in size and weighs 240 kg, operates in the 225-400 mHz range in amplitude modulation mode with an output power of up to 100 W.

Ultrashort-wave communication, which is required for transmission of digital information of the automated combat control system and for operation of the Aegis system, is provided by an AN/URC-93(V) radio station (Figure 4 [not reproduced]). It provides a possibility for employing a LINK-11 communication line with frequency modulation, and it operates in radio-telephone mode with amplitude and frequency modulation. Rod aerials are employed in this case.

Shortwave and medium-wave radio stations are intended for work in telephone, telegraph and digital communication modes in the radio networks of operational formation (group) commanders and in ship-to-shore and shore-to-ship communication links. The transmitters of these stations have an emission power from 100 W to 1 kW depending on the type of work. The AN/URT-23(V) ship shortwave transmitter is believed to be typical. It operates in the 2-30 mHz range in manual telegraph mode with amplitude modulation, in automatic printing mode at a rate of 75 bits/sec and in radio-telephone mode with single-band amplitude modulation. The transmitter's standard frequency oscillator forms a spectrum consisting of 280,000 fixed operating frequencies with an interval of 100 Hz, with each one being tunable. The transmitter (its dimensions are 88x50x51 cm and its weight is 159 kg) has output power within 100 W and 1 kW, and it can operate by way of an AN/URA-38 automatic matching device using a rod aerial 4.6, 7.7 or 10.7 m tall. The transmitter can be controlled from three remote points on the ship up to 125 m away using a remote control system.

Over 20 radio receivers, including 13 shortwave (2-30 mHz) and nine all- wave (0.01-30 mHz), are installed in the cruiser's radio room for message reception. The receiving apparatus is connected to the appropriate

terminal devices for digital, telegraph or telephone communication. The operator of the central communication post monitors its work, the precision of tuning to the operating frequency, and switching of antennas and terminal devices.

Telegraph messages and radiograms received by a ship through various communication equipment and outgoing messages are sorted and distributed by means of the automated NAVMACS-B subsystem. It is serviced by personnel of the document distribution and duplication group at the central communication post. Its main functions are: receiving and processing all incoming and outgoing radiograms, and their priority distribution among addressees aboard ship in printed form or relaying them to external addressees by means of ship communication equipment; selecting radio networks and message transmission equipment; storing all correspondence passing through the center. The NAVMACS-B automated telegraph message distribution subsystem is made up of AN/SYQ-7(V)3 apparatus, which includes two standard AN/UYK-20 ship computers with AN/USH-26(V) magnetic storage devices, two AN/USQ-69 displays, two TT-624(V)5/UG medium-speed printers, an RD-397/U punched-tape information input device, and an SA-2278/U device for communication with external parties. To permit duplication of messages the center is equipped with two Savin-780 copiers. Radiograms received by the ship are automatically recorded, duplicated and transmitted to the ship's combat information post, the navigator's room and the bridge by means of pneumatic message tubes, while other messages are sent to their addressees by way of the central communication post. Outgoing radiograms are stored in the computer memory and automatically fed to the appropriate transmitters in accordance with its program.

A cruiser's SVS telephone communication subsystem includes an SA- 2112(V3)/STQ automatic switchboard servicing 85 parties connected to the ship's internal communication system. In this case 33 parties may be connected to external radio-telephone lines. When necessary, the number of parties aboard ship may be doubled by installing a second automatic switchboard. To ensure greater dependability of telephone communication aboard ship, there is a manual switchboard that becomes operational immediately after the automatic switchboard breaks down. Connections to external communication lines are made by a TA-970/U radio-telephone communication device, which connects the calling party's handset to shortwave or ultrashort-wave radio communication equipment or the satellite communication system depending on the number of the party being called.

A scrambler ensures security and safety of radio communication when working with external parties.

The CSS communication security subsystem contains electronic-mechanical scramblers, coding apparatus, nine coding devices for ultrashort-wave radio equipment and three for shortwave equipment. They are located in isolated compartments of the radio room. These compartments contain up to seven places reserved for various coding apparatus in the event that it becomes necessary to open additional secure communication channels.

**Footnote**

1. For greater detail on this, see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1984, pp 84-85.—Editor.



## American SH-60F Antisubmarine Warfare Helicopter

*18010215l Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) p 59*

[Article by Col A. Ivanov]

[Text] The USA is nearing completion of full scale development of a future antisubmarine warfare helicopter, designated the SH-60F Ocean Hawk, begun in 1985. It is a modification of the LEMPS Mk3 system SH- 60B Sea Hawk multipurpose carrier helicopter. Judging from information in the foreign press, beginning in 1989 SH-60F helicopters are to gradually replace SH-3H Sea King helicopters on carriers, adopted in 1974 after routine modernization (the first modifications of the Sea King helicopter were received in the early 1960s). Replacement of the SH-3H is required chiefly by expiration of their working life, equal to 10,000 hours.

According to the plans of the developers the SH-60F helicopter, which is being designed with regard for the experience of operating Sea Hawk helicopters on different classes of ships, and using new technology, should reliably support protection of carrier strike groups against modern and future enemy submarines within the internal antisubmarine zone. In addition, according to the requirements they should also support search and rescue functions. In this case the helicopter can take up to five persons on board in a single sortie.

According to American specialists the design of the SH-60F makes use of a large number of units and parts of the Sea Hawk. This will make it possible to raise its reliability, and, while maintaining approximately the same maximum takeoff weight and size as the Sea King helicopter, to increase the payload by 40 percent in hovering mode and the time of flight to 4 hours with a 10 percent fuel reserve and two torpedoes aboard. In this case the profile of ASW flight consists of the following phases: warming the engines and takeoff (5 min); flight to the search area, located 50 nautical miles from the carrier, at a cruising speed of 185 km/hr; search for the target (50 percent of the time in hovering mode using a lowered sonar system, and 50 percent of the time in short transfers at cruising speed); return flight at cruising speed

and landing on the carrier. A digital automated control system maintains the prescribed flying altitude and speed and flight modes associated with entering into and exiting from hovering mode when carrying out a target search using the sonar system. According to the technical requirements, the probability that the helicopter would carry out its combat assignment must be 0.965, while the time until so-called critical failure is 119 flying hours.

For convenient accommodation of helicopters on carriers (six aircraft on each), the main rotor blades and tail boom fold. The helicopter's propulsion unit consists of two T700-GE-401 turboshaft engines with a maximum power of 1,700 horsepower each. The main units and parts of the engines, which generate a maximum speed of around 300 km/hr, have an anticorrosive coating. The helicopter can be refueled by the ship fuel system while hovering.

Onboard electronic equipment is being developed on the basis of processors and several multiplex buses for information exchange between the four crewmembers—the first and second pilot, the acoustic apparatus operator and the tactical situation operator. This equipment includes a subsystem for receiving, processing and displaying data used to evaluate the tactical situation. It consists of four units by means of which the navigation, communication, acoustic and nonacoustic apparatus and the onboard weapons are controlled. An AN/AQS-13F lowered sonar system is to be used to search for submarines; its basic components include an acoustic antenna, a digital acoustic signal processing computer, the acoustic apparatus operator's indicator, and a winch and cable 450 m long.

The SH-60F helicopter can also take two to four Mk46 or Mk50 torpedoes aboard. According to American experts it has the following advantages over the SH-3H: automatic entry into and exit from hovering mode during search for a submarine using the sonar system; a higher cruising speed when making short transfers during search; better acceleration and deceleration characteristics (the time required for the helicopter to go from horizontal flight at a height of 45 m to hovering mode is 45 sec); greater depth of submergence of the sonar system's antenna (450 m), and its fast lowering (4.6 m/sec) and raising (6.3 m/sec); lower load on crewmembers. In addition the possibility for installing other equipment in the future, particularly forward-looking radar or infrared stations, as well as a NAVSTAR satellite navigation system receiver and an AN/UYS- 2 acoustic signal processor, was accounted for during development of the SH-60F helicopter. In this case its takeoff weight may be increased to 10,660 kg.

The first flight of the experimental model was made in March 1987. Experimental helicopters are presently in the flight testing stage. The U.S. Navy plans to purchase a total of 175 helicopters.



## Draft U.S. Military Budget for Fiscal Year 1989

*18010215m Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 61-67*

[Article by Col Ye. Zubrov and Lt Col V. Yefremov]

[Text] The most direct and visible expression of the principal trends in the policy of the Reagan administration concerned with war preparations, development of the armed forces and financing of military production can be found in the dimensions, dynamics and structure of the military budget. The Defense Department budget is the principal official document regulating the financing of the maintenance and development of the American armed forces; it quite clearly reflects the direction and features of the foreign policy and military strategy course of the ruling circles of the USA. It is no accident that discussion of the military budget in congressional commissions is associated more and more closely with the process of revealing military political priorities and developing the corresponding foreign political doctrines and military strategic conceptions. It is with regard for these doctrines that the principal military programs of the Defense Department assume their final form. The general proportions of expenditures are established and allocations are distributed among different categories and items of the military budget in accordance with these programs. The budget provides a clear picture of the economic essence of military policy adopted by the administration and implemented by the Defense Department.

In 1987 the Reagan administration submitted a draft military budget (the so-called Federal "National Defense" program) covering two fiscal years in succession—1988 and 1989—to the U.S. Congress for examination. According to the draft, $332.4 billion were requested for military purposes in fiscal year 1989. However, failure to fulfill the plans to reduce the Federal budget deficit (in fiscal year 1987 the deficit ceiling was set at $144 billion while the deficit actually reached $173.2 billion, and in 1988 the deficit is estimated to be $146.7 billion, as opposed to the planned $107.8 billion) compelled the administration to reduce its requests for the "National Defense" program to $299.5 billion, which exceeds the level of fiscal year 1988 by only 2.8 percent.

As follows from the U.S. Defense Department's five-year program, allocations for military purposes in fiscal year 1993 will be over $370 billion, while for the five-year period as a whole (1989-1993) they will be around $1.7 trillion.

The bulk of the official military budget (over 97 percent) is intended directly for the Pentagon. According to the foreign press, the U.S. Defense Department requested allocations totaling $290.8 billion in fiscal year 1989.

In addition sizable financial resources are allocated for military preparations through civilian departments and agencies. Thus the Department of Energy plans to allocate $8.1 billion to military programs, which is around 65 percent of the total requested for this department. The plans foresee allocating $4.2 billion to the development, testing and production of nuclear weapons, including warheads for intercontinental ballistic missiles (ICBMs) and cruise missiles, and nuclear bombs and artillery projectiles. Large sums—around $3 billion—will be allocated to production of nuclear materials and interment of radioactive wastes. The Department of Energy is to play a prominent role in implementation of the SDI program. Around $0.4 billion are to be allocated to it for these purposes in fiscal year 1989.

The Federal Emergency Management Agency plays an important role in the military economic preparations of the United States. $325 million have been requested to support its activities in fiscal year 1989. These assets will be used to improve the U.S. civil defense system, to prepare the basic sectors of industry for war, to train a reserve of executives for wartime and to implement other measures.

In parallel with allocations based on the official "National Defense" program, significant assets are allocated to military purposes by way of civilian items of the Federal budget. A clear example of this can be found in the activities of the National Aeronautics and Space Agency (NASA). Outwardly the budget of this organization has a purely civilian orientation, and it is included in the Federal program "General Science, Space and Technology," but the U.S. Center for Defense Information estimates that a quarter of this program is oriented on military objectives. In particular a sizable proportion of the assets allocated to NASA—around a third of the budget—are directed into the Shuttle program, which has an important role in implementing SDI.

Creation of permanent space stations with applied military significance has an important place in NASA's activities. $967 million were requested for these purposes in fiscal year 1989—almost 2.5 times more than the previous year.

A total of $11.5 billion are to be allocated to NASA in fiscal year 1989 (a 29.2 percent increase over 1988).

Information published abroad on the distribution of the Defense Department's allocations among its main programs provides the fullest impression of the directions of armed forces development (Table 1). $23.4 billion have been requested for the "Strategic Forces" program, which is 8 percent of the Defense Department's budget. These allocations are intended chiefly for purchases of weapon systems (Table 2). In addition important significance is attached to improvement of strategic defensive forces.

**Table 1. Distribution of the U.S. Defense Department's Budget Allocations Among the Main Programs ($ Billions)**

| Main Programs | Fiscal Years 1987 (Actual) | 1988 (Estimate) | 1989 (Projected) |
|---|---|---|---|
| Strategic forces | 21.1 | 21.0 | 23.4 |
| General purpose forces | 114.9 | 110.7 | 114.1 |
| Military development, development of communication, surveillance, monitoring and control systems | 27.7 | 28.0 | 28.1 |
| Troop airlift and sealift forces | 7.1 | 5.6 | 5.9 |
| Armed forces reserves (including the National Guard) | 15.7 | 16.2 | 16.6 |
| Research and development* | 27.5 | 32.5 | 32.6 |
| Centralized rear supply and armament repair | 22.7 | 24.1 | 24.1 |
| Training, medical service and logistical support to personnel | 35.5 | 35.9 | 36.6 |
| Administrative activities | 6.6 | 5.8 | 6.0 |
| Military assistance to other countries | 0.7 | 0.8 | 0.8 |
| Special operation forces | - | 2.6 | 2.6 |
| Total | 279.5 | 283.2 | 290.8 |

*Excluding scientific research and experimental design work on systems approved for production.

**Table 2. Budget Allocations for Purchases of Principal Weapon Systems for Strategic Forces ($ Billions)**

| Weapons System (Number of Systems Purchased) | Fiscal Year 1988 (Estimate) | 1989 (Projected) |
|---|---|---|
| MX ICBMs (12) | 0.874 | 0.809 |
| Trident-2 submarine-launched ballistic missiles (66) | 2.047 | 1.874 |
| "Ohio" class nuclear ballistic missile submarines (1) | 1.283 | 1.436 |

Allocations to the "General Purpose Forces" program continue to increase at a high rate. $114.1 billion are to be allocated to this program in 1989, which is 39.2 percent of the Defense Department's budget. These assets are for maintenance and equipment of ground troops, air force tactical aviation and the navy (excluding nuclear ballistic missile submarines). It should be noted that the large sums allocated to special purpose forces in fiscal year 1988 are oriented chiefly on increasing the fighting power of naval surface forces. Thus Congress approved allocations amounting to $6.3 billion for the construction of two nuclear powered aircraft carriers

(the budget request did not foresee allocation of assets for these purposes), and a significant sum—over $4 billion—will be released for the construction of five "Ticonderoga" class guided missile cruisers in place of the two previously planned.

Measures to improve combat control, communication and reconnaissance systems operating within the framework of a global armed forces operational control system are to play a special role. The volume of allocations to these purposes in the program "Military Reconnaissance, Development of Communication, Surveillance, Monitoring and Control Systems" exceeds the amount of financial resources for maintaining and equipping strategic forces (see Table 1).

The desire of the leadership of the USA to attain military and technical superiority over the Soviet Union is reflected in the continual growth of the proportion of the program "Research and Development" within the total allocations to the Defense Department. $32.6 billion were requested for fiscal year 1989 for scientific research and experimental design work associated with developing new resources of armed conflict. Just in the period from 1987 to 1989 the proportion of this program will grow from 9.8 to 11.2 percent. The allocated assets will be used on research and development in the SDI program ($4.5 billion), and for development of Trident-2 ballistic missile submarines, Midgetman ICBMs ($200 million) and so on.

Work is proceeding on a new fighter for the air force, a helicopter for the ground troops, a nuclear multipurpose submarine and many other weapon systems for the purposes of increasing the fighting power of general purpose forces. Over $13 billion are to be released for these purposes.

The military-political leadership of the USA is devoting unweakening attention to raising the mobility of the armed forces. There are plans to allocate $5.9 billion in fiscal year 1989 to the program "Troop Airlift and Sealift Forces"; $1 billion of this amount are requested for the purchase of four C-17 military transport airplanes.

Growth in allocations for fiscal year 1989 is also planned in the main programs "Armed Forces Reserves," "Centralized Rear Supply and Armament Repair," "Training, Medical Service and Logistical Support to Personnel" and "Administrative Activities" (see Table 1).

An 11th main program will be included in the Defense Department's five- year program in 1988—"Special Operation Forces." These forces are intended chiefly for participation in low intensity conflicts. As in 1988, $2.6 billion are to be allocated to this program in 1989.

The structure of allocations to specific items in the Defense Department's budget also attests to the White House's desire to increase the fighting power and combat readiness of the country's armed forces (Table 3). This is manifested chiefly in the continual growth of assets allocated to scientific research and experimental design work. Allocations for these purposes will attain $38.2 billion in 1989 (13.1 percent of the Defense Department's budget). As in previous years, financial assets for the development of future technologies are increasing at the highest rate, with over 70 percent of this development pertaining to the Star Wars program.

**Table 3. Distribution of Budget Allocations of the U.S. Defense Department Among Specific Items ($ Billions)**

| Allocation Items | Fiscal Year | | |
|---|---|---|---|
| | 1987 (Actual) | 1988 (Estimate) | 1989 (Projected) |
| Combat training, personnel maintenance, operation and repair of weapons and military equipment, other | 155.5 | 157.0 | 163.6 |
| Purchases of weapons and combat equipment | 80.2 | 81.0 | 80.0 |
| Scientific research and experimental design work | 35.6 | 36.7 | 38.2 |
| Military development and housing support | 8.2 | 8.5 | 9.0 |
| Total | 279.5 | 283.2 | 290.8 |

The largest proportion of allocations requested by the administration for research and design is intended for the air force—39 percent, while the navy is to receive 24.1 percent and ground troops are to receive 13.1 percent. Research and design funds for the Defense Department's directorates and agencies are growing preferentially (they will increase by a factor of 1.4 in 1987-1989). This is explained by the fact that financial resources for the Star Wars program are allocated not to the armed forces but to the Organization for Implementation of SDI. As a result directorates and agencies of the Defense Department have been receiving more money for research and design than the ground troops since 1985.

The sums allocated for purchases of weapons and combat equipment will be somewhat smaller in 1989 compared to the preceding year. As before, significant assets are to be allocated chiefly for the acquisition of aviation equipment (over 35 percent of allocations for purchases) and rocket and space equipment (over 20 percent).

It is noted in the foreign press that in recent years approximately identical financial resources have been

allocated to maintaining and equipping the air force and the navy—31-32 percent of the Defense Department's budget (Table 4). The ground troops receive about 27 percent. Large sums are allocated to the Defense Department's directorates and agencies. This is associated chiefly with the high rate of growth of assets for research and development within the SDI program. In 1989 over 23 percent of the $19.3 billion requested for the Defense Department's directorates and agencies are to be allocated for these purposes.

**Table 4. Distribution of Allocations from the U.S. Defense Department's Budget Among the Armed Services ($ Billions)**

| Armed Service | Fiscal Year | | |
|---|---|---|---|
| | 1987 (Actual) | 1988 (Estimate) | 1989 (Projected) |
| Ground troops | 74.0 | 75.8 | 77.8 |
| Air force | 91.6 | 88.2 | 97.2 |
| Navy | 93.5 | 100.1 | 96.4 |
| Defense Department directorates and agencies | 20.4 | 19.1 | 19.4 |
| Total | 279.5 | 283.2 | 290.8 |

**Table 5. Distribution of Allocations from the U.S. Defense Department's Budget for Purchases of Weapons and Combat Equipment Among the Armed Services ($ Billions)**

| Armed Service | Fiscal Year | | |
|---|---|---|---|
| | 1987 (Actual) | 1988 (Estimate) | 1989 (Projected) |
| Ground troops | 15.2 | 15.3 | 15.1 |
| Air force | 32.0 | 27.1 | 33.2 |
| Navy | 30.8 | 36.1 | 30.3 |
| Defense Department directorates and agencies | 2.2 | 2.5 | 1.4 |
| Total | 80.2 | 81.0 | 80.0 |

There are plans for allocating $33.2 billion for the purchase of weapons and combat equipment for the armed forces in fiscal year 1989; this is 41.5 percent of all assets released to the Defense Department for these purposes (Table 5).

$16.6 billion were requested for acquisition of aviation equipment. The plans of the air force for fiscal year 1989 foresee purchasing 36 F-15A Eagle tactical fighters ($1.5 billion) and 180 F-16A Fighting Falcon fighters ($3.7 billion).

Besides purchases of new airplanes, the air force will continue to modernize aviation equipment presently in the inventory—B-52 strategic bombers ($216 million) and KC-135 tankers ($604 million).

There are plans to allocate $8.2 billion for the acquisition of rocket and space systems. These assets are to be used to purchase 12 MX ICBMs for a total of $807 million. In addition the air force plans to purchase 354 Sparrow guided missiles ($56.1 million) and 760 Sidewinder air-to-air guided missiles ($48.3 million), 2,540 Maverick air-to-ground guided missiles ($260.4 million), 1,470 medium-range air-to-air AMRAAM (AIM-120) guided missiles ($825.3 million) and 893 HARM antiradar missiles ($216.1 million) in 1989.

Part of the assets released for air force rocket and space equipment—$4.5 billion—are intended for the purchase of three launch vehicles, one satellite for the DMSP (Defense Meteorological Satellite Program) satellite weather system and two satellites for the DSP (Defense Support Program) ballistic missile early warning system, and for implementation of a number of "closed" programs.

There are plans for allocating $14.9 billion to the air force's research and design programs (39 percent of the Defense Department's total assets for scientific research and design work, Table 6). The bulk of the allocations—$5.4 billion—will finance strategic programs, to include development of the mobile small Midgetman ICBM ($20 million) and the air-to-surface SREM-2 guided missile ($231 million). Scientific research and design work is also being conducted to modernize B-1B strategic bombers ($222 million) and Minuteman ICBMs ($61 million). Tactical programs are supporting development of a tactical fighter of the future ($702 million), which is to replace the F-15 and F-16 fighters in the late 1990s, and of the C-17 military transport aircraft ($961 million). $238 million are to be allocated to the creation of the JSTARS (Joint Surveillance and Target Attack Radar System).

**Table 6. Distribution of Allocations from the U.S. Defense Department's Budget for Scientific Research and Design Work Among the Armed Services ($ Billions)**

| Armed Service | Fiscal Year | | |
|---|---|---|---|
| | 1987 (Actual) | 1988 (Estimate) | 1989 (Projected) |
| Ground troops | 4.6 | 4.7 | 5.0 |
| Air force | 14.9 | 14.7 | 14.9 |
| Navy | 9.3 | 9.4 | 9.2 |
| Defense Department directorates and agencies | 6.8 | 7.9 | 9.1 |
| Total | 35.6 | 36.7 | 38.2 |

The development and purchase of the new B-2 strategic bomber are financed under "closed" programs. A total of 132 airplanes are to be produced.

$46.7 billion have been requested for combat training and logistical support of the air force and for maintenance of servicemen.

The naval forces plan to allocate $30.3 billion for the acquisition of weapons and combat equipment, which is about 38 percent of all assets allocated for this purpose to the Defense Department.

Purchases of aviation equipment and ships of different classes are the principal direction in the financing of equipment support to this armed service. Around $9 billion have been requested for acquisition of aviation equipment for the navy in 1989, to include $2.1 billion for production of 72 F/A-18 airplanes, $0.8 billion for 12 F-14A Tomcat deck-landing fighters, and $0.5 billion for 24 AV-8B vertical or short takeoff and landing aircraft.

There are also plans for purchasing nine EA-6B Prowler electronic warfare airplanes ($0.5 billion), six E-2C Hawkeye AWACS airplanes ($0.3 billion) and seven E-6A TAKAMO relay airplanes ($0.3 billion).

Sizable assets are to be used to equip the navy with helicopters. There are plans for purchasing eight SH-60B LEMPS Mk3 carrier helicopters ($0.3 billion) and 14 CH-53E Super Stallion tactical troop-lift helicopters ($0.2 billion).

$0.9 billion were requested in fiscal year 1989 for modernization of naval aviation equipment, and $1.2 billion were requested for spare parts acquisition.

There are plans for allocating $9.1 billion to the program for construction of warships and auxiliary vessels. These assets will be used to build 28 new ships. In accordance with this program $1.4 billion have been requested in 1989 for construction of 16 "Ohio" class nuclear missile submarines. The navy is also pursuing a major program of construction of nuclear submarines. Two "Los Angeles" class nuclear submarines will be ordered on the basis of assets allocated in fiscal year 1989; allocation of $1.4 billion for construction of the nuclear submarine "Seawolf"—the first of a series of 33 units—has also been foreseen. Assets have been requested for the purchase of three "Orly Berk" guided missile destroyers ($2.2 billion) and one "Wasp" class general-purpose amphibious assault ship ($0.7 billion).

There are plans for purchasing missiles for aircraft and ships totaling $5.4 billion in 1989. In particular, 66 Trident-2 ballistic missiles for "Ohio" class nuclear missile submarines ($1.8 billion), 510 Tomahawk cruise missiles ($0.7 billion) and 138 Harpoon antiship missiles ($170 million) for "Los Angeles" class nuclear submarines and surface ships, 1,307 HARM antiradar guided missiles ($302 million) and 560 Phoenix guided missiles ($465 million) for carrier aviation, and so on.

$9.2 billion were requested for scientific research and design work in behalf of the navy. Around 60 percent of these allocations are to finance tactical programs. The largest amount is intended for programs to develop the future V-22 Osprey vertical or short takeoff and landing airplane ($307 million), submarine combat systems ($382 million), "Seawolf" class nuclear submarines ($195 million), a tactical information system ($116 million) and Mk50 torpedoes ($135 million). There are plans to allocate $152 million to scientific research and experimental design work to modernize F-14 Tomcat deck-landing fighters.

$581 million were requested under strategic programs for continuation of the development of the Trident-2 nuclear missile submarine, and $54 million were requested for development of strategic communication systems.

There are plans for allocating $54.4 billion to combat training, logistical support and maintenance of servicemen.

A typical feature of the budget of the ground troops is that a significant proportion of it is earmarked for combat training, for maintenance of personnel and for logistical support—$54.7 billion, or about 70 percent of the entire budget of this armed service.

$15.1 billion are being requested for purchases of weapons and combat equipment for the U.S. Army. These assets will be used to purchase 545 M1 Abrams tanks ($1.1 billion), and 585 M2 Bradley infantry fighting vehicles and M3 fighting reconnaissance vehicles ($0.7 billion).

Modernization of the army helicopter fleet is continuing. There are plans for ordering 72 AH-64A Apache helicopter gunships ($0.8 billion) and 72 UH-60A Black Hawk multipurpose helicopters ($252 million) in 1989.

The American administration intends to allocate $2.6 billion to equipping the ground troops with missiles: $819 million to buy 815 missiles for the Patriot surface-to-air missile system, $242 million to acquire 6,750 portable Stinger surface-to-air systems, and $144 million to produce 12,000 TOW-2 antitank guided rockets. In addition these assets are to be used to purchase 48,000 rocket projectiles for the PC30 multiple rocket launcher system ($407 million) and 66 rockets for the ATACMS (Army Tactical Missile System) tactical missile system ($81 million).

The ground troop command is devoting special attention to purchases of electronic control, communication, reconnaissance and electronic warfare equipment. Around $3 billion are being allocated for these purposes.

There are plans for allocating $5 billion for research and design programs in behalf of the army. $4.4 billion are to be allocated to the creation of new weapon systems, and $0.6 billion will be allocated for improvement of systems already in the inventory. The principal programs are development of a future light helicopter ($125 million), a troop antiaircraft system ($166 million), a divisional air defense control system ($98 million), a future antitank system ($111 million) and the ATACMS tactical rocket system (84 million), and improvement of the family of armored fighting vehicles ($82 million).

Significant sums are being allocated to the Defense Department's directorates and agencies: for the purchase of military equipment—$1.4 billion, for research and design—$9.1 billion. SDI is the principal financing program—$4.5 billion.

On the whole, the draft military budget for fiscal year 1989 submitted by the administration attests to the USA's intentions to continue adhering to a course of increasing its military power and attaining military superiority over the USSR and countries of the socialist fraternity.

To justify the plans for promoting an even more intensive arms race, American strategists resort to the fabricated and decaying myth of a "Soviet military threat."

Today, now that the world has accumulated a colossal arsenal of mass destruction weapons, real security of states may be ensured only by achieving international agreements to halt the arms race, which would make it possible to free for productive uses the enormous resources of mankind presently absorbed by military production.

The Soviet state and its allies have no desire to attain military superiority, but they will not allow disruption of the military- strategic equilibrium that has evolved in the world arena. At the same time they are consistently working to see that the level of this equilibrium would decrease continually, that the quantity of arms possessed by both sides would decrease, and that the security of all nations would be guaranteed.



## Container Processing Capabilities of the Ports of European NATO Countries

*18010215n Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) pp 67-73*

[Article by Capt 1st Rank A. Melnikov]

[Text] The dependence of the economy of Western European countries on foreign trade, especially on imports of oil and the principal strategic raw materials by sea, makes improvement of the work of seaports an urgent issue on the agenda. Seaports are also the principal reception points for the transfer of reinforcement troops from the USA and Canada to Europe.

There are more than 600 large and medium seaports in the bloc's European countries, to include over 200 with an annual freight turnover of over 1 million tons (figures 1 and 2 [figures not reproduced]). According to an estimate by foreign specialists around 3 million tons of various cargo, including over 1.5 million tons of oil and petroleum products, are imported daily through them. Data of Bremen's institute for marine shipping problems reveal that in the early 1980s, the total annual freight turnover between North American and Western European countries was around 2 trillion ton-kilometers, with imports of cargo from the USA and Canada exceeding exports by a factor of three. States of the Far and Middle East also occupy an important place in Western Europe's foreign trade ties. The annual turnover with them was over 630 billion ton-kilometers at the beginning of the present decade, with imports of cargo into Western European countries twice exceeding exports.

Marine military shipments of the NATO countries, and especially of the USA and Great Britain, are made in peacetime by transport vessels belonging to the corresponding military departments, and by some vessels of the merchant fleet chartered by them on a long-term basis. But as the experience of the aggressive wars in Korea and Vietnam and of the armed conflict over the Falkland (Malvinas) Islands showed, a significant number of commercial vessels are needed to support the significantly increasing volume of military shipments. Foreign military specialists believe that container and

rolker [transliteration] ships of the merchant fleets of the NATO countries are the best suited for this task, and they are developing the corresponding plans for their use.

Shipments of general cargo in high capacity containers, which began in the mid-1960s, have now conclusively confirmed themselves as a promising direction in the development of cargo shipping. Container ships with cellular design offer the clearest advantages (in comparison with shipping packaged and piece cargo aboard conventional general-purpose dry-cargo vessels). First of all the throughput of the ports is increased by a factor of 8-10 due to sensible organization of freight handling operations at specialized container terminals, where up to 25 containers are processed hourly by a single container handler (even up to 55 at the Delta container terminal in Rotterdam). Second, the cost of freight operations decreases, the number of personnel required for these operations drops, and the time to deliver cargo by sea decreases. For example owing to a reduction of the time a vessel remains in port, the duration of a Europe-USA-Europe trip is only 25-30 days, as opposed to the typical 60-70.

The total capacity of cellular container ships represents about 50 percent of the capacity of all container ships of the world's countries. In the last 10 years their number increased by a factor of 2.2, and container carrying capacity increased by a factor of 2.5. The fleet of this type of container ships possessed by NATO countries represents about half the container tonnage; in this case the greatest numbers of container ships are possessed by the USA (deadweight around 3 million tons), the FRG (almost 2 million), Great Britain (approximately 1.4 million), Denmark (over 1.2 million), France (0.8 million) and the Netherlands (almost 0.5 million). The FRG occupies first place in total capacity of container ships (around 250,000 containers); then follow the United States (205,000), Great Britain (over 110,000), Denmark (over 80,000) and France and the Netherlands (73,000 each).

Creation of vessels with higher container carrying capacity is presently the principal direction in construction of container ships. The portfolio of orders of the world's ship building docks attests to this. Around 50 percent of them are for vessels with a capacity of 2,500 containers or more.

Rolker and rolker-container ships (Figure 3) intended to carry trailers, containers, various self-propelled equipment and oversized and other piece cargo have enjoyed wide acceptance in the last decade. They combine high productivity of freight handling operations typical of cellular container ships with the possibility for transporting a great diversity of cargo. The advantage of rolker-container ships, especially those with a carrying capacity less than 1,000 containers, is that they can be used for shipments "from any port to any port." Nonetheless half-container ships, some of the holds of which are partitioned for containers (with an average capacity of 340 containers) and some are used to carry packaged and piece cargo, are the most numerous type of vessels in the world container fleet (over 40 percent in the mid-1980s).

The increase in shipment of cargo by progressive methods necessitated improvement of ports. According to the foreign press there are around 200 ports in European NATO countries today with over 1,000 container and roll-on moorings (the latter allow self-propelled equipment to roll directly onto a vessel, or tractors, power loaders and so on can be employed). This is almost four times greater than their number at the beginning of the 1970s. Over 60 ports possess the best-equipped container terminals with deepwater moorings, high productivity freight handling equipment, warehouses, rail sidings and automated control systems. These are, in Great Britain—Felixstowe, London, Southampton, Hall, Belfast, Ipswich, Liverpool, Harwich, Greenock, Garston, Bristol, Manchester and Middlesborough; in France—Le Havre, Marseille, Fos, Rouen, Dunkirk, Cherbourg, le Verdon, Nantes; in the FRG—Hamburg, Bremerhaven (Figure 4), Bremen; in the Netherlands—Rotterdam, Amsterdam, Vlissingen; in Belgium—Antwerp, Zeebrugge, Ghent; in Spain—Algesiras, Barcelona, Valencia, Bilbao, Santa Cruz de Tenerife, Las Palmas, Palma, Alicante; in Denmark—Esbjerg, Copenhagen, Aarhus; in Portugal—Lisbon, Leyshoys [transliteration] (in the vicinity of Porto); in Italy—Genoa, Livorno, Venice, Ravenna, Naples, Trieste, Ancona, Palermo, La Spezia; in Greece—Piraeus, Salonika; in Norway—Oslo, Moss, Bergen, Drammen, Stavanger; in Turkey—Mersin, Iskenderun, Istanbul, and others.

Over 320 container moorings (85 percent of the total number in the region), more than 370 roll-on moorings (approximately 50 percent) and around 260 container loaders (almost 95 percent) are concentrated in these ports. Just the container cranes at the moorings can process an average of around 2 million tons of general cargo per day. Ports in the Netherlands, Belgium, the FRG, Great Britain, Italy, Spain and France have the greatest possibilities for container loading (see table).

**Container Turnover of the Largest Container Ports of European NATO Countries**

| Port, Country | Number of Containers Loaded in 1985, Thousands |
|---|---|
| Rotterdam, Netherlands | 2,681 |
| Antwerp, Belgium | 1,375 |
| Hamburg, FRG | 1,159 |
| Bremen and Bremerhaven, FRG | 986 |
| Felixstowe, Great Britain | 850 |
| Le Havre, France | 566 |
| Marseille and Fos, France | 488 |
| London, Great Britain | 482 |
| Livorno, Italy | 475 |
| Barcelona, Spain | 353 |
| Genoa, Italy | 325 |
| Algesiras, Spain | 351 |

**Container Turnover of the Largest Container Ports of European NATO Countries**

| Port, Country | Number of Containers Loaded in 1985, Thousands |
|---|---|
| Valencia, Spain | 305 |
| La Spezia, Italy | 235 |
| Southampton, Great Britain | 214 |
| Zeebrugge, Belgium | 214 |
| Ravenna, Italy | 199 |
| Esbjerg, Denmark | 199 |
| Piraeus, Greece | 197 |
| Hall, Great Britain | 182 |
| Belfast, Great Britain | 159 |
| Aarhus, Denmark | 155 |
| Lisbon, Portugal | 154 |

Regularly operating cargo-passenger and passenger ferry crossings are widely used in NATO countries for direct rail and motor vehicle communication between the countries of Europe and North and West Africa. When necessary they can also be used for military cargo. Bloc countries possess a ferry fleet with a total deadweight of around 900,000 tons, which is over a third of the world total. The most important Western European ports possess approximately 150 slips (60 percent of the region's) for reception and processing of motor vehicle and rail ferries. Large flows of cargo pass through ferry slips. For example around 2 million units of transportation resources and 14 million passengers are carried through the English ferry port of Dover annually. Large container ports also handle sizable volumes of motor vehicle equipment.

On the whole, in the estimates of Western specialists, the ports of NATO European countries are able to simultaneously load (unload) around 380 container ships, half-container ships and general-purpose vessels, to include over 240 high-capacity cellular container ships and bulk carrier-container ships with a deadweight of 20,000-50,000 tons each, and over 700 rolkers, rolker-container ships and ferries, including around 130 high-capacity rolker vessels. This fully satisfies the demand of Western European countries for imports (exports) of general cargo and military shipments.

Some of the most important Western European ports that may be used to support military shipments are described briefly below as an example.

Rotterdam—the port with the world's largest freight turnover, it also occupies first place in container transloading. This is one of the principal transit ports of Western Europe, and a major ship building and ship repair center of the Netherlands. It is located on the northern arm of the Rhine delta, and it communicates with the North Sea by the New Waterway Canal. The port's territory and water basin (including around 50 convenient harbors) occupy almost 122 $km^2$. The overall length of the mooring front, with regard for masonry quays, is 126 km; of this amount, 80 km of moorings with depths from 5.6 to 23.5 m are used to receive and process marine shipping, and 46 km service river shipping.

The port has 12 container terminals and four multipurpose terminals with a total mooring front length of 14.9 km. The terminals are equipped with 44 container and 17 roll-on moorings capable of simultaneously accepting up to 30 high capacity cellular container ships, 10 high capacity rolker vessels and around 20 other container and rolker vessels and medium and low tonnage ferries. Thirty-six special container loaders with a loading capacity of 30-70 tons, 24 portal container cranes with a capacity of up to 60 tons and a large quantity of other freight handling equipment operate at the moorings. The total area of the container terminals is 390 hectares.

The Europa container terminal (Figure 5), the largest in Europe, has been built at the port. It is outfitted with a modern automated control system. The length of the terminal's mooring front is 3,200 m, and the depth at the moorings is 13 m. There are 15 container loaders here making it possible to process up to 1 million containers each year. The first generation of the modern Delta container terminal has been operating since 1984 as well. The length of its moorings is 1,200 m. The terminal is equipped with seven new high productivity loaders and container loaders.

The port's equipment makes it possible to simultaneously process up to 100 tankers with a maximum deadweight of 350,000 tons and a displacement of 22.0 m. In addition the port possesses mooring facilities for reception and processing of vessels transporting packaged, piece and bulk cargo (coal, ore, grain, fertilizer and others), and 250 piers servicing river self-propelled and nonself-propelled vessels.

The port possesses great possibilities for storing cargo. For example the total capacity of oil and petroleum product tank farms exceeds 32 million $m^3$, and that of bulk cargo platforms is almost 16 million tons, including around 500,000 tons for grain. The total area of warehouse space is approximately 1.4 million $m^2$.

The building docks of eight ship building and ship repair companies have been accommodated in the port and contiguous regions. Their productive capacities are capable of building and repairing vessels with a deadweight of up to 500,000 tons. There are 27 dry docks (the largest being 405x90x10.4 m) and floating docks and over 20 building slips here.

Rotterdam is linked to many states by freeways and railroad lines.

On the whole, the port's structures and equipment make it possible to process up to 300 vessels of different classes simultaneously. More than 300 shipping companies service 12,500 regular runs to various ports of the globe. An average of about 90 vessels with a total tonnage of 730,000 gross register tons come to the port each day. Of these vessels, 70 percent have a tonnage of 10,000 to 100,000.

The total freight turnover of the port averages over 250 million tons per year, with 40 percent being oil and petroleum products and around 20 percent being ore, scrap metal, coal and coke. Almost 3 million containers (over 22 million tons of cargo) and 250,000 units of transport equipment (over 5 million tons) are transloaded.

Antwerp is said to be one of the world's largest container ports, occupying second place (after Rotterdam) in Europe in overall freight turnover. It is Belgium's principal marine commercial port and its important ship building and ship repair center. Port structures are situated mainly on wharves along the Schelde River. Internal closed basins communicate with the river by canals equipped with six locks. The total area occupied by the port's grounds and water basins is 260 $km^2$. The length of the mooring front attains 98 km, and the maximum depth at moorings is 18 m.

Fourteen terminals have been erected in order to accelerate cargo processing in the port, to include four multipurpose terminals with a total mooring line length of 10.4 km and mooring depths of 5.5-18 m. Thirty container and 15 roll-on moorings that can simultaneously process 25 high-tonnage cellular container ships and nine high-tonnage rolker vessels have been built at the terminals. The moorings are equipped with 15 special container loaders with a capacity of 35-50 tons each, 15 portal container cranes and a large quantity of other freight handling equipment. The total area of the container terminals (Figure 6) is 285 hectares.

Tankers with a displacement of 5.6-15.2 m are accommodated at more than 20 moorings. The latter are equipped with highly productive freight handling resources. The port has great possibilities for storing various cargo. The total capacity of liquid cargo storage is around 10 million $m^3$, including almost 7 million $m^3$ intended for oil and petroleum products. Elevators can store up to 260,000 tons of grain. The area of warehouse space is 2.4 million $m^2$.

The building docks of seven ship building and ship repair companies operate here; the more than 20 dry docks up to 475x65x8.0 m in size can build and repair vessels of different classes with a deadweight of up to 320,000 tons.

The port's annual freight turnover is almost 90 million tons; of this amount, over 40 percent is general cargo, and around 20 percent is oil and petroleum products. Up to 1.4 million containers are transloaded (12 million tons of containerized cargo—that is, around a third of all general cargo).

Construction of new container terminals and improvement of existing ones is continuing even today at a number of ports of Western European countries. Container and multipurpose terminals were placed into operation in the mid-1980s in Rotterdam, Antwerp, Nantes, Rouen, Hamburg, Bremerhaven and Felixstowe. Container complexes (utilizing modern equipment and computers for their control) are being erected in Great Britain (Falmouth, Harwich, Sheerness), Spain (Bilbao, Las Palmas), Italy (Genoa, Cagliari, Bari, La Spezia), France (Le Havre), Denmark (Copenhagen, Aarhus), Portugal (Leyshoys), the Netherlands (Rotterdam), Greece (Piraeus, Salonika) and Turkey (Trabzon, Mersin, Izmir).

There are specialized ports in order to permit the most effective operations with cargo of predominantly one category (for example ports transloading raw materials and finished products from metallurgical industry enterprises—ore, ferrous and nonferrous metals, coal, coke, scrap metal and so on). The most important transloading points outfitted with highly productive freight handling mechanisms are: in Great Britain—Blyth, Port Talbot, Khanterston [transliteration], Cardiff; in Norway—Narvik, Kirkenes; in the Netherlands—IJmuiden; in the FRG—Byuttsflet [transliteration]; in Spain—Gijon, Almeria; in Italy—Piombino, Marina di Carrara, Monfalcone, Bagnoli; in France—Port-de-Bouc; in Turkey—Zonguldak and Eregli.

Besides civilian cargo and passenger shipping, countries of the North Atlantic bloc also engage in major military shipping in peacetime. The bulk of the latter is carried out by the USA and Great Britain, which support the day-to-day activities of formations and units of their own armed forces deployed in Western European countries.

Judging from materials in the foreign press, the principal seaports for unloading (loading) and transloading military cargo, including fuel, food and other material and technical articles, are Bremerhaven, Wilhelmshaven, Hamburg (FRG), Rotterdam, Amsterdam, Emskhafen [transliteration] (the Netherlands), Southampton, Liverpool, London, Harwich, Sheerness (Great Britain), Le Havre, Donges, Dunkirk (France), Oostend, Antwerp, Ghent, Zeebrugge (Belgium), Rota, Algesiras, Malaga (Spain), Aalborg, Frederikshavn, Esbjerg (Denmark), Bergen, Oslo, Bodo, Stavanger, Tronheim (Norway), Augusta, Livorno, Genoa, Naples, Trieste, La Spezia, Bari, Brindisi (Italy), Piraeus, Salonika, Volos, Suda [transliteration], Iraklion, Kerkira (Greece).

On the whole, in terms of engineering and technical equipment, the seaports of Western European NATO countries possess sufficient capabilities to support military shipments both in peacetime and in wartime.

## Growth of Great Britain's Nuclear Missile Arsenal

*18010215o Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) p 74*

[Article by Capt 1st Rank Yu. Shangin]

[Text] The process of radical improvement of the international situation and reduction of nuclear missile potentials initiated by the signing of the Soviet-American treaty on reduction of medium-range missiles is finding more and more proponents throughout the whole world. However, judging from everything, Great Britain's Conservative government has no intention of joining this process. The Tories continue to adhere to a course of expanding their nuclear missile arsenal.

In late 1987 the English government signed a contract with Vickers Ship Building and Engineering worth 425 million pounds Sterling for the construction of the nuclear missile submarine "Victorious"—the second "Vanguard" class nuclear missile submarine of the Trident-2 nuclear missile system. The total cost of building the boat will be 800 million, not counting the cost of ballistic missiles purchased from the USA. And although the cost of building the "Victorious" is 30-40 million pounds Sterling less than the cost of the lead submarine, this will be little consolation for English taxpayers. After all, the entire Trident program, which foresees construction of four nuclear missile submarines and creation of the infrastructure for their maintenance at Fasleyn [transliteration] Naval Base, is estimated at 9-10 billion pounds Sterling. In fiscal year 1987-1988 685 million were allocated to its implementation, 950 million are planned for the current fiscal year (which began on 1 April), and 1.100 billion are planned for 1989-1990.

The nuclear missile submarine will be built by Vickers Ship Building and Engineering at a plant in the city of Barrow-in-Furness. Around 64 percent of all orders (with respect to cost) associated with implementing the program will be placed with British enterprises. Twenty-seven thousand persons will be employed by these orders.

Given the growing difficulties of the British economy and the decrease in growth of military expenditures forced by this situation, the enormous assets channeled into the Trident program compel the English military leadership to abandon or postpone some programs for equipping the armed forces with conventional arms. For example the naval command was compelled to reexamine the plan for construction of surface ships in the direction of its reduction, and to reject purchase of an additional 18 tactical Harrier-GR.5 fighters and equipping project 22 frigates with new sonar stations. The air force is getting less money for the purchase of new fighters, and deliveries of the reconnaissance version of the Tornado airplane will be postponed to a later time. The ground troops have been forced to abandon development of antitank mines.

Completion of the Trident program is foreseen in the second half of the 1990s. The "Vanguard" nuclear missile submarine should be introduced into the fleet's effectives in 1994. The naval command announced selection of volunteers for training to serve aboard this missile submarine in late 1987. The navy's acceptance of four "Vanguard" class nuclear missile submarines will increase Great Britain's nuclear arsenal by 64 American Trident-2 strategic ballistic missiles with MIRV warheads developed and produced in England.



## New Sonar Station for Combat Swimmers

*18010215p Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 88 (Signed to press 10 Aug 88) p 77*

[Article by Capt 2d Rank V. Mosalev]

[Text] The USA's General Instruments has developed the "Bernet" [transliteration] AN/PQS-2A small sonar station. It is intended to detect various submerged objects, including anti-assault landing obstacles, mines and other objects. It weighs 3.2 kg (3.6 kg with the battery), it is 31 cm long, its diameter is 11 cm, and it is 22 cm tall. In water the station has neutral buoyancy, and it is intended for work at depths to 90 m. It is made out of low-magnetic materials, and the intensity of its own magnetic field is less than 4.0 μA/m.

The station can work in passive and active modes. In sound locating mode it is capable of detecting acoustic emissions within the 24-45 kHz range; in this case the range of detection of the object subjected to location is 1,828 m when its acoustic pressure is 150 dB (at a frequency of 39 kHz), corrected for 1 μPa and a distance of 1 m. In active mode the station emits directional frequency modulated signals in the 115-145 kHz range (the width of the beam pattern is 6°). A submerged object 30 cm in diameter may be detected at a range of up to 108 m. The station's control console has a switch for three range scale positions (20, 60 and 120 m), loudness and frequency controls and a shut-off switch. The outfit includes headphones.

The U.S. Navy has already signed a contract for delivery of 204 outfits of the AN/PQS-2A station. General Instruments, which is anticipating more orders, is seeking permission from the American government to sell this station to other countries.

## Articles Not Translated from ZARUBEZHNOYE VOYENNOYE OBOZRENIYE No 8, August 1988

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